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DEFENSE INDUSTRY BULLETIN

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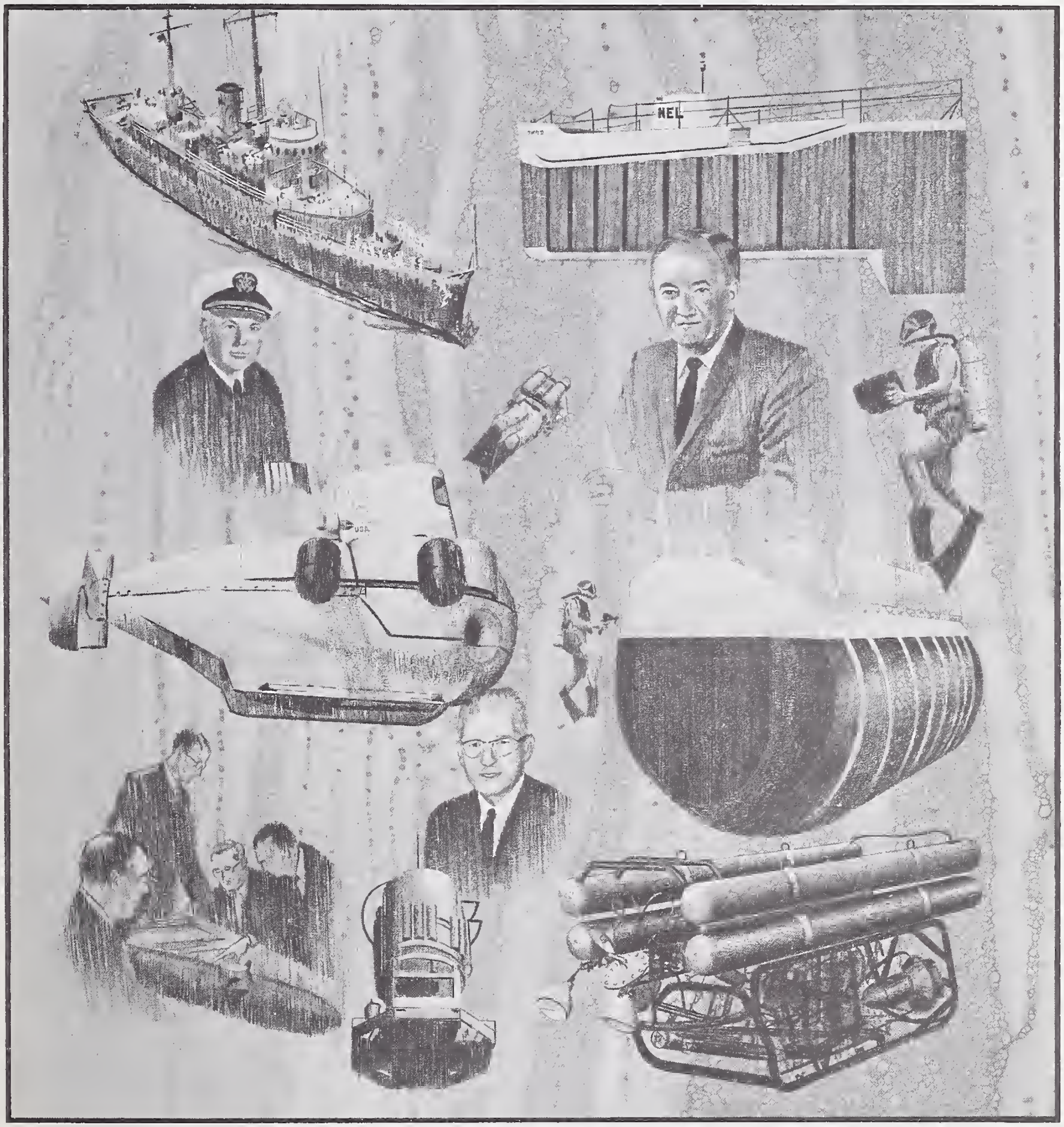

OCEANOGRAPHY

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The purpose of the *Bulletin* is to serve as a means of communication between the Department of Defense (DOD) and its authorized agencies and defense contractors and other business interests. It will serve as a guide to industry concerning official policies, programs and projects, and will seek to stimulate thought by members of the defense-industry team in solving the problems that may arise in fulfilling the requirements of the DOD.

Material in the *Bulletin* is selected to supply pertinent unclassified data of interest to the business community. Suggestions from industry representatives for topics to be covered in future issues should be forwarded to the Business & Labor Division.

The *Bulletin* is distributed without charge each month to representatives of industry and to agencies of the Department of Defense, Army, Navy and Air Force. Requests for copies should be addressed to the Business & Labor Division, OASD(PA), Room 1E764, The Pentagon, Washington, D.C. 20301, telephone, (202) OXford 5-2709.

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BULLETIN

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Boundless Frontiers

Americans have been famed for their adventurous spirit since the first settlers stepped ashore on the rocky coast of the new world over 300 years ago. The enterprising quality, which stimulated the pilgrims to undergo all kinds of hardships in the search of a better way of life, was also the driving force behind the westward movement of the early pioneers. The continual push of those rugged Americans into new frontiers led to the development of a vast wilderness which has resulted in one of the strongest nations in the history of the world.

This pioneering trait continues in America today with the work being carried on at the South Pole and with extensive efforts to reach into space.

At the same time, we are now beginning to assault the world's last undeveloped wilderness—the oceans of the globe, the last frontier on Earth.

This venture is filled with both promise and risk. The promise is an almost bottomless well of natural resource. The risk is the one ever present in international competition. For we are not alone in our belated recognition that oceanography is the nucleus of a critical totality—national strength at sea.

But how much do we really know about the three-fourths of our planet that is covered by water to depths as great as seven miles, a boundless frontier extending from the Arctic Ocean to the Antarctic Continent?

An examination of man's continuous struggle with the sea indicates that much of the helplessness, which he has experienced in the past, could have been avoided had he possessed greater knowledge and understanding of the oceans. One of the greatest oceanic tragedies of our time could have been prevented if, in 1912, we had known more about the currents of the North Atlantic, their intensity, tracks, and springtime consistency. On the night of April 14 of that year, the ocean liner Titanic sideswiped an iceberg suffering such extensive damage that she sank within a few hours, carrying over 1,200 people to frigid graves.

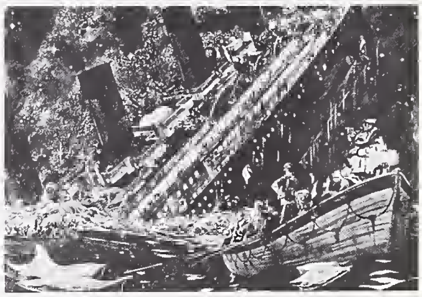
A more recent example of man's inability to cope with the forces of the deep occurred in April 1963, when the nuclear attack submarine, USS Thresher, disappeared during a routine test dive east of Cape Cod, Mass. At about the same time that this tragedy occurred, the U.S. space probe, Mariner II, was passing by Venus, a distance of over 100 million miles from Earth, sending back scientific information about the planet. Back on Earth, however, we were helpless in locating the doomed submarine which lay on the ocean floor, a mere 8,400 feet from the surface.

Thus it can be seen that knowledge of the ocean is more than a matter of curiosity. Ability to understand this environment, predict its behavior, use its potential in peace, and apply its potential in war is vital to American security and progress.

Oceanography, the study of the sea, is not one science but rather an application of all the earth sciences—physical, chemical, biological and geological.

The oceanographer's concern is not only the ocean depths but also the lands beneath, the life nourished by the ocean and its influence on our total environment. Ultimate control of weather phenomena, created by the interactions of the oceans, the atmosphere and the sun, is dependent upon more complete knowledge of ocean space.

The oceans began, according to theory, about three billion years ago as the earth's surface temperature dropped below 100 degrees centigrade. In addition to the moisture condensation from the clouds, it is believed that water was released to the surface by volcanic action, bringing with it considerable quantities of salt from the interior of the earth.



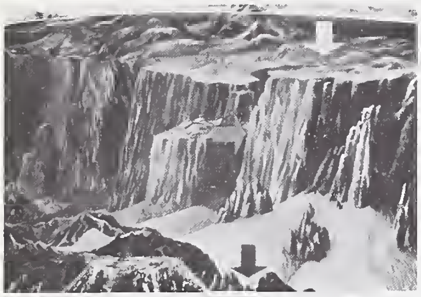
Today, if the earth's surface was rearranged to eliminate peaks and valleys to form a perfect sphere, the accumulation of water could cover the land one and one-half miles deep.

Over 100 years ago, U.S. Navy Lieutenant Matthew F. Maury became the world's first true oceanographer. The information that he systematically gathered and analyzed became a collection of maritime secrets used by the captains of the clipper ships. From the data he collected on ocean currents and winds, he was able to chart the fastest trade routes for the clippers to follow.

Seeing the advantages of scientific study of the ocean, the British undertook the first world-wide oceanographic survey, in 1872, with Her Majesty's Ship Challenger.

Knowledge gained from the survey revealed that continental shelves constitute about seven percent of the land beneath the oceans. It was discovered that these shelves slope about 10 feet per mile and extend varying distances seaward from the continental shores. For instance, the shelf extends only one mile off the coast of California, while off northern Europe and Siberia it extends to about 750 miles, with the terrain slope increasing sharply at the edge of the shelf. This area is called the continental slope. Beyond the continental shelves and slopes, in the deep-sea area, lies the ocean floor, over half the earth's land, at an average depth of more than 10,000 feet.

Actually, "floor of the ocean" is a misleading term. It implies something flat and featureless. The shape of the bottom is anything but flat. With its continental shelves, mid-ocean range, truncated islands and deep canyons, the floor of the Atlantic Ocean presents some of the most rugged terrain found anywhere in the world.



The floor of the ocean, from the continental shore, is covered by sediment accumulated over millions of years. It contains a wealth of history of the past life of our planet. For instance, it has been learned that vast areas of the Pacific were once blanketed by a thick layer of ash from a massive volcanic eruption that occurred between 60,000 and 80,000 years ago. By core sampling of the sediment, it has been found in some areas that about one inch reveals 1,000 years of history. In other areas, a 30-foot length core reveals history as far back as nine million years.

Although study of oceanography is receiving more attention each year, even today our maps and charts of the ocean floor are very primitive—comparable to land maps of the 18th century. In fact, only two percent of the oceans are charted adequately.

Another aspect of oceanographic study is the movement of the seas, including sub-surface as well as surface currents. Ocean currents might be compared to rivers as we know them on land. One such current has been discovered two miles beneath the water surface in the Bay of Bengal. It is estimated to carry a volume of water 25 times that of the Mississippi River. Meteorological studies have shown that changes in large scale weather patterns, over periods of weeks to many years, are closely related to changes in the temperature distribution of the water layers near the surface of the sea.

Scientific ocean current observations indicate that improvements in long range weather forecasting can be made through studies of the interactions between the oceans and the atmosphere.

The sea behaves more sluggishly than the air. For instance, the Gulf Stream, 40 miles wide and 3,000 feet deep, flows at the rate of 50 miles a day; in contrast, some of the upper atmosphere winds are known to move at 100 miles an hour in a band 400 miles wide and 20,000 feet in depth.

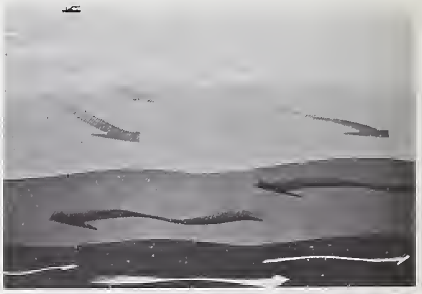
In the late 1700s, Benjamin Franklin prepared a chart of a portion of the Gulf Stream, giving a basis to the concept of thermometrical navigation by comparing, with a common thermometer, temperatures of water dipped up in an old oaken bucket.

The Humboldt Current, which exerts a direct influence on the west coast of South America, is another ocean river that scientists have been able to chart. As this current flows up the coast, it keeps the coast line arid. However, a small shift in the course of this current brings torrential rains and floods which has resulted in economic disaster to many coastal communities.

The ocean has been referred to as a global thermostat, and there is no doubt that the interactions among the ocean, the atmosphere and the sun actually create weather. Consider the Gulf Stream and the Humboldt Current, along with the circulation patterns of the atmosphere. What would happen if this natural balance between ocean and atmosphere were upset? Suppose we had a deflection or diversions, or a warming or cooling of currents? The cold regions might become temperate. And the climate at Miami Beach might become polar bear weather.

One of the advantages to be gained from oceanography is increased accuracy of the long range weather forecasting. If weather could be more accurately predicted, great economic benefits could result in such areas as planting and harvesting crops, planning seasonal fuel transportation and storage, proper timing of building and road construction, and flood and drought protection. A 50 percent improvement might well produce savings of two billion dollars a year.

Increased oceanographic data will also make it possible to compile more detailed forecasting of tidal waves, or tsunami as they are called by scientists, resulting in speedier alerts to coastal communities which might be affected. The tsunami is produced by a sudden, large scale motion of a portion of the ocean floor or the shore by volcanic eruption, earthquake, or landslide. These erratic surges have struck in many parts of the world, and have cost thousands of lives and millions of dollars in property damage.

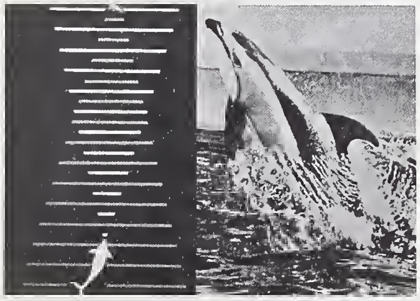


In 1964, a giant tidal wave lashed the western shores of Alaska leaving seaport areas in a shamble of wreckage and debris. Advance knowledge of the approaching tsunami gave Alaskans a chance to protect themselves and to prevent greater damage by applying precautionary measures.

The ocean as a source of food and other useful resources is another benefit to be gained from exploiting the sea frontier. However, we know surprisingly little about the nature and behavior of the life forms found in the sea. It would be of great benefit if fishermen could learn the mysteries of fish migration, or answer such questions as where the huge California tuna and Alaskan salmon have gone in the past few years.

Every year thousands of walrus congregate in the Aleutian Islands, then they disappear. Where do they go? To what oceanic area do they migrate? Wherever it is, sea life there must be in abundance, for the ocean furnishes their food. Here is another unsolved mystery of the sea. Increased study of the biological aspects of oceanography may give us the answer.

Studies of the shark and the porpoise may lead to advances in naval ships and underwater weapons design. Experiments with the porpoise, for example, have revealed that these animals can navigate by a built-in sonar which emits rapid sound waves from the lower part of the head. These appear to serve as both detector and range finder. The Navy has found that the porpoise emits 80 pulses per second in search of food, and that these pulses abruptly diminish to 30 pulses per second as he closes in on his victim.



Navy scientists have also determined that the dolphin has extraordinary powers of navigation and homing sense. If the secret of the dolphin's efficiency could be discovered, ship and torpedo design could be revolutionized.

The oceans of the world could also provide a solution to the ever looming threat of over-population in the near future. In addition to the fish available in the sea, there are various kinds of vegetation and minute sea life. Many may prove to be palatable and nutritious. Perhaps it is plankton—the main source of nutrition for fish. A few food derivatives from mass cultivation of sea water algae have been successfully used in bread, noodles, soup, and even ice cream.

However, the most important undeveloped potential food source for man is protein from the fish, lobster and other seafood that inhabit the oceans. New methods of locating and attracting sea life will improve the efficiency of fishermen and produce larger catches.

We might expand the cultivation of fish farms, to include large oceanic regions, that could be placed under systematic and scientific control to increase reproduction and reduce losses. Man must inevitably turn to the sea for the food resources he needs. The sea not only constitutes more than two-thirds of the earth's surface, but it is also about 100 times more fertile than the land area.

The large shelf areas in the southern hemisphere are still untapped, and the deep water areas of both hemispheres are virtually ignored. It is not a question of abundance with the oceans, but rather a question of how to get the product to the consumer.

Not only do the oceans need to be explored to assess resources, but we must take the guesswork out of catching fish. Moreover, preservation methods, such as freeze drying, producing fish protein concentrates, or fish flour, need to be more widely accepted and used.

In this way, oceanographic research can help a hungry world feed itself.

Although not directly related to oceanography, parts of the world are thirsty, too. Like food, the growing world population, coupled with higher demands of industry and agriculture, requires new sources of fresh water.

While the world's supply of fresh water is approximately constant, the requirement will have doubled by 1980. Even now we are faced with the pressing need for fresh water in some areas. The only promising source appears to be in the conversion of salt water.

Such a method is now being used as a source of fresh water at the Guantanamo Bay Naval Station. The desalinization plant was installed three years ago when Fidel Castro turned off the local supply of fresh water, in a move to harass the base. The plant, installed to meet the demands of an emergency situation, is now helping to make the base self-sufficient through sea water conversion. A very large scale, nuclear-powered desalinization plant will soon be constructed off the coast of California.

In addition to food and water supply, the sea is a tremendous storehouse for at least 50 of the known elements. Cobalt has been extracted from lobsters, and copper is used in their physiological processes. Vanadium is in the blood of sea cucumbers, and certain mollusks use nickel in their life processes.

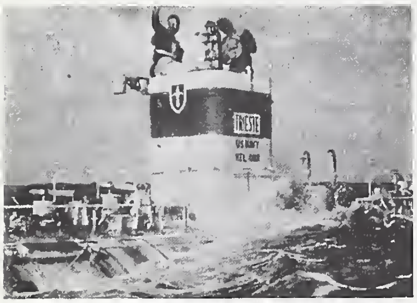
Even though the 38 pounds of gold dissolved in a cubic mile of sea water is not now recoverable, gold is also found in the sea floor, and efforts have already been made to mine it off the coasts of northern California and Alaska. It has been discovered that concentrations of manganese nodules cover vast regions of the central Pacific. Commercially exploitable deposits of phosphorite have been found off southern California.

Quantities of diamonds have been discovered and are being mined from the continental shelf of the Republic of South Africa. One thousand carats are mined every day, with a predicted recovery of 5,000 carats a day when additional dredges are put into operation.

It has been estimated that 40 percent of the world's available petroleum is located under the continental shelves. Although 16 percent of the petroleum used by the Free World now comes from beneath the sea bed, this vast reserve has been barely touched. In the United States, oil has been produced from offshore drillings in California, Texas and Louisiana.

Now let us take a look at some of the things being done to learn more about the earth's cubic miles of the oceans' space and the lands beneath them.

Man can descend and work four to six hundred feet into the sea with the aid of special underwater breathing equipment, and experiments at greater depths are planned. However, for extremely deep descents, the Navy has a bathyscaph, called the Trieste. Buoyed by a compartmented tank filled with lighter-than-water gasoline and ballasted with metal shot, the Trieste can descend about six feet per second clear to the bottom of the ocean floor. In 1960, the Trieste, with two scientists aboard, journeyed six and one-half miles down into the Marianas Trench where the pressure is about seven tons per square inch.



U.S. Navy Lieutenant Don Walsh and Swiss designer and builder, Jacques Piccard, the two men making the descent, were motivated to risk their lives exploring such depths because, in Lieutenant Walsh's words, "We are in a grim race for time, with survival as the prize. Nothing can substitute taking trained minds and eyes into the environment to study the dynamics of the oceans."

At the tremendous depth of 37,000 feet, Walsh and Piccard were able to see living creatures moving around the ocean bottom, and also to determine that ocean currents are active at that level.

After the submarine Thresher was lost, the Secretary of the Navy chartered a group of oceanographic scientists and Navy experts to explore deep submergence systems. The mission of the Deep Submergence Systems Project is divided into two categories:

- To develop a quick capability of operating in, and recovering a vessel from, the continental shelf area—depths down to about 1,000 feet.
- To explore the ability to work in depths down to 20,000 feet.

Concurrently, the economic influence of ocean exploration began to work on industry. An example of independent industrial work in this area resulting in new environmental equipment is Deepstar, developed by Westinghouse, with an operating depth of 12,000 feet.

Alvin, another deep-water research vehicle sponsored by the Office of Naval Research and operated by Woods Hole marine scientists, will open to man's eyes for the first time one-sixth of the ocean floor—an area almost equal to that of the moon. Alvin is smaller and weighs less than the USS Holland, the Navy's first submarine launched in 1900, but will operate at depths a thousand times greater. On July 20, 1965, Alvin completed its first deep trials to 6,000 feet off Andros Island in the Bahamas.

The first phase of the Navy's "Man-in-the-Sea" program, SEALAB I, began in July 1964. Four Navy aquanauts spent 10 days working at 192 feet beneath the Atlantic surface, 26 miles southwest of Bermuda. They lived in a steel capsule, under pressure of 86 pounds per square inch, in an atmosphere that consisted of 80 percent helium and four percent oxygen.

The second phase of this program, SEALAB II, began in mid-August 1965. Working in the area around their undersea quarters, situated on the ocean bottom at a depth of 210 feet off La Jolla, Calif., 10 aquanauts evaluated experimental salvage techniques, conducted scientific research, and underwent physiological and performance tests for a period of 30 days.

SEALAB III, the third open ocean phase of the Navy's Man-in-the-Sea program, is scheduled for the summer of 1968. In this experiment, Navy aquanauts will test salvage techniques, engage in oceanographic and marine biological research, and undergo a series of physiological and human performance tests. The most complex ocean engineering experiment attempted to date, SEALAB III will be held 450 feet below the surface off the shores of San Clemente Island, Calif., where five teams of eight men each will occupy an underwater habitat alternately for 12-day periods during the scheduled 60-day experiment.

Despite these efforts, it must be admitted that the United States, as well as most of the other nations in the world, has been slow to recognize the full potential of the oceans.

Even today, only a few universities offer a graduate education in the fields associated with oceanography. Approximately 17 universities in the United States offer study in oceanography on the doctoral level. The present graduation rate of doctorates per year will not sustain the effort required to meet the nation's needs in this field.

Although recognition of the potential has been slow, the challenge and need are, at last, being defined. Technology is now pressing against the environment of the oceans, with oceanography as the tool and trained environmental scientists as the weapons.

The military and non-military applications of oceanography are numerous.

In the military field, an improved diving capability will provide a greater scope to such operations as amphibious beach preparations and explosive ordnance disposal. Anti-submarine warfare forces need more information about the ocean medium. Ocean-bottom mounted surveillance systems have been degraded in one form or another by surface dependency. Improved technology should bring results in easier service and more accurate bottom positioning. Mine warfare, weapons recovery, wave prediction, sonar forecasting, and many other military requirements could be bolstered by increased information about the ocean environment.

As our nuclear attack submarines go faster and deeper in the vast battlefield of ocean space, greater knowledge of the ocean is needed to develop undersea warfare tactics. The role of the submarine has progressed beyond anti-shipping and reconnaissance to include the pursuit of enemy submarines.

To obtain the knowledge needed to bolster these military programs, the Navy's oceanographic research objectives are being pursued by 27 universities, five Federal and four industrial laboratories, and the Oceanographer of the Navy. In addition, about 20 laboratories are pursuing, under research contracts, related programs, such as marine biology, marine meteorology, and coastal geography. Two research vessels and over a dozen survey ships carry out the Navy's oceanographic field work, and over 20 university-operated ships are now in operation.

In attaining its military objectives, the United States will gain both scientific and economic benefits. However, industrial ocean engineering is not yet supported by a broad enough technological base to fulfill our total national interest. As in the exploration of space, man is needed on the spot to observe and conduct experiments.

The Russian Bear is not hibernating in this field. For several years, the Soviets have been and are still exploring the ocean bottoms in our own backyard. Today, Soviet Russia has about 200 oceanographic ships. This is more than three times the number the United States has available. This vast fleet does not include the hundreds of Soviet fishing trawlers known to be engaged in oceanographic exploration.

The late President Kennedy summed up our need for increased ocean knowledge in March 1961 when he said, "We are just at the threshold of our knowledge of the oceans. Already their military importance, their potential use for weather predictions, for food, and for minerals are evident. Knowledge of the oceans is more than a matter of curiosity. Our very survival may hinge upon it."

In March 1967, President Lyndon B. Johnson, in his first Report to the Congress on Marine Resources and Engineering Development, stated, "The depth of the sea is a new environment for man's exploration and development, just as crossing the West was a challenge in centuries past.

"We shall encounter that environment with the same conviction and pioneering spirit that propelled ships from the Old to the New World.

"We shall bring to the challenge of the ocean depths—as we have brought to the challenge of outer space—a determination to work with all nations to develop the seas for the benefit of mankind."

The foregoing article is based upon a presentation, titled "Boundless Frontiers," prepared by the Office of the Chief of Naval Operations.

"Boundless Frontiers" is a 35mm slide presentation consisting of 80 color slides and associated text. Copies may be obtained on a library-loan basis from the Commandant of your nearest Naval District (see addresses in next column) or by writing direct to:

Director, Special Studies and Presentations Group (Op–09D)
Office of the Chief of Naval Operations
Department of the Navy
Washington, D.C. 20350

The Editor

Oceanography Film Available to Public

"Mission Oceanography," a new U.S. Navy color documentary film, produced by the Public Affairs Office of the Oceanographer of the Navy, is available for loan to the general public free of charge.

The film traces the history and development of oceanography in the United States and other maritime nations.

Since its release, the film has been recognized as an outstanding documentary science film receiving awards at the American Film Festival, the International Maritime Film Exposition in Italy, the ANZAAS International Scientific Film Exhibition of Australia, and others.

Prints of the film can be obtained from Public Affairs Offices of Naval District headquarters at the following addresses:

First Naval District
495 Summer St.
Boston, Mass. 02110

Third Naval District
90 Church St.
New York, N.Y. 10007

Fourth Naval District
U.S. Naval Base
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Washington Navy Yard
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The Challenge of the Marine Sciences

Vice President Hubert H. Humphrey
Chairman, National Council on Marine Resources and Engineering Development

The President's initial recommendations, set forth in his report to the Congress in March 1967, reflect our awareness that the benefits of the sea can and must more and more serve the needs of our growing and increasingly urbanized society—the needs for food, minerals, energy and recreation; for commerce and economic growth; and for strengthened national security and improved international understanding.

Let me briefly review some of these challenges that face our nation and the world today:

- There are one and one-half billion hungry people in the world. The full food potential of the seas, seriously neglected in the past, must be realized to combat famine and despair. Technologies now at hand can be directed toward increasing the world's fishing catch and enriching the diets of the underfed.
- Seventy-five percent of our population lives along our coasts and Great Lakes. Nine of our 15 largest metropolitan areas are on the oceans and Great Lakes and three are on ocean tributaries. Twenty million children live in these metropolitan areas within sight of potential water recreation areas, but are often denied their use. Only three percent of our ocean and Great Lakes coast line has been set aside for public use or conservation.
- More than 90 percent by value of our intercontinental commerce travels by ship. Although there have been rapid changes in the character of ocean cargoes and technologies of cargo handling, the average age of our port structures is 45 years and the average age of our merchant ships is 19 years.
- The continuing threats to world peace require our Navy to maintain a high level of readiness and versatility through a sea-based deterrent and undersea warfare capability. Middle East conflicts following closure of the Gulf of Aqaba vividly emphasize the urgent need for a strengthened code of international law of the sea.
- Thirty million Americans swim in the oceans, 11 million are salt-water sport fishermen, and eight million engage in recreational boating in our coastal states, yet industrial wastes being dumped into ocean tributaries will increase seven-fold by the year 2000 unless there are drastic changes in waste handling.
- Ocean-generated storms cause millions of dollars of damage annually along our coasts, but marine weather warning services are available to less than one-third of our coastal areas.

During the past year I have discussed these challenges with scientists, engineers, business leaders, and local, state, and Federal officials in Washington, at oceanographic installations in nine coastal states, and in the capitals of six countries of Western Europe and one in Asia.

The problems of the sea are complex, and they involve every type of concern and institution that exists on the landward side of the shore line. Thus we must solicit the varied ideas, the advice, and the participation of universities, industry, and all elements of Government, just as we have found this mixture an essential ingredient for the vitality and progress of our nation on shore.

Vice President Hubert H. Humphrey

For seven years, the Congress and the scientific community have insisted on more intensive action to reap the benefits of the sea. Now the Administration is responding to the Congressional mandate—building on long-standing capabilities within 11 Federal departments and agencies and accelerating our progress with a new enthusiasm and determination, a new sense of direction and momentum.

We are:

- Identifying goals, and milestones to reach these goals.
- Setting priorities.
- Developing purposeful programs to bring our ocean interests into balance with our overall national interests.
- Clarifying agency responsibilities to develop individual and collective capabilities.
- Mobilizing our resources—government, academic and industrial.

We singled out a number of marine science areas for particular emphasis during FY 1968 and, by concentrating diverse projects on a selected number of objectives, have begun to obtain a greater effect from a still modest enterprise. We are critically examining the opportunities for FY 1969, realizing that current actions will significantly affect the course we chart during the next several years.

Certain of these programs are the responsibility of a single agency but, increasingly, new programs cross agency lines. The National Council on Marine Resources and Engineering Development is taking steps to prevent unnecessary duplication and to insure that program gaps do not occur.

We are fortunate to have a close association with the advisory Commission on Marine Science, Engineering, and Resources. While the com-

(Continued on Page 35)

Marine Science Affairs: Impetus and Promise

Dr. Edward Wenk Jr.

Vice President Hubert H. Humphrey in the article beginning on the preceding page stated that "The continuing threats to world peace require our Navy to maintain a high level of readiness and versatility through a sea based deterrent and undersea warfare capability."

Defense is one of the most serious challenges which the Vice President described as facing our nation today, but there are others, too. Two common denominators in these challenges are the oceans and man. The Vice President also wrote, "The problems of the sea are complex, and they involve every type of concern and institution that exists on the landward side of the shore line."

Despite our ocean-oriented beginnings, this nation let its interest in marine affairs wax and wane. Occasionally, in the course of human events, man looks at his world and himself, and thoughtfully and deliberately charts his course. That is what this nation is now doing with regard to the marine sciences. The problems are not so much nautical as they are technological and social. They are human affairs occurring in a marine environment. What is significantly different about our approach is a specific landmark of impetus, a collective national decision expressed through the Marine Resources and Engineering Development Act of 1966.

Ocean Science Policy

With that Act, the United States acquired, for the first time, an explicit national policy "to develop, encourage and maintain a coordinated, comprehensive, and long-range national program in marine sciences for the benefit of mankind." This legislation marked a turning point in our nation's interests in the sea. It recognized that previous investments in the quest for scientific knowledge have borne fruit, and that we should intensify our efforts to utilize marine resources more deliberately and to strengthen ocean-based industries to serve our national purpose.

During the past seven years or so, this nation developed world leadership in scientific achievements, an unexcelled fleet of research ships and laboratory facilities, and a vigorous base of professional talent. Now we seek to apply these capabilities to the broad purposes of our nation—to the economic, political and social goals that transcend the geographic demarcation between land and water.

Dr. Edward Wenk Jr. is the Executive Secretary of the National Council on Marine Resources and Engineering Development. Prior to this appointment Dr. Wenk headed the Science Policy Research Division of the Library of Congress. Early in his career he served at the David Taylor Model Basin where he was responsible for the Navy's ship structural research program. Later at the Southwest Research Institute, San Antonio, Tex., he originated the concepts for deep-running submarines and designed the Aluminaut research submersible.

Man's problems do not stop at the water's edge; neither should the solutions. Thus we find in marine science affairs the same diversity and complexity of scientific disciplines and techniques, the wide range of activities and institutions that characterize man's activities on land. These concern national security; maritime transportation; development of fishery resources, minerals, oil and gas; urban redevelopment; recreation; pollution abatement and control; health and safety; expansion of man's knowledge about his own environment; domestic economic growth; foreign economic development; and international cooperation and collaboration. It is, thus, not surprising that marine science activities, evolved historically in 29 bureaus of 11 different Federal departments and agencies, are of direct interest to a number of different Congressional committees, numerous state, regional and international organizations, many universities and a wide variety of industries.

This new legislation provided a coherent purpose to a diversity of activities, institutions and competing interests that derive a unity from a common marine environment. The Act also established a clear focus for national leadership. No new operating agency was established. Pending completion of studies now under way, the present Federal agency structure is continued, with responsibility for overall policy planning and coordination placed in the Office of the President, with advice and assistance of the National Council on Marine Resources and Engineering Development. As one consequence of the legislation each Federal agency has reviewed its own programs, its priorities, and its organization. At the same time the agencies are endeavoring to meet these goals individually, they are working collectively through the council.

Marine Sciences Council

In accordance with the legislation, the National Council on Marine Resources and Engineering Development is headed by the Vice President and is composed of five cabinet officers and three department and agency heads having significant maritime-related activities (see Figure 1).

The role of the council is to assist the President by identifying government-wide issues, by evaluating alternative policies, and by formulating a balanced and consistent set of marine science priorities and programs. The council has begun to:

- Delineate marine science activities in relation to national goals.
- Develop a comprehensive program to be conducted by 11 Federal departments independently or in cooperation with states, academic institutions, and industry.
- Designate and fix agency responsibilities and facilitate cooperation among Federal agencies.
- Examine appropriate roles for public and private investment.
- Undertake legal studies of problems arising out of the management, recovery and control of marine resources.
- Initiate long-range studies of the potential benefits of marine science activities to the U.S. economy, security, health and welfare.

Implementation is entirely the responsibility of the operating agencies, but the council seeks to assist them in building on existing strengths in every way possible. When missions cross agency lines, however, the council may designate a lead agency to assume responsibility for interagency planning and coordination.

Nine "Initiatives"

The President's first major assignment to the council was to request recommendations for the FY 1968 budget. Nine areas were isolated for special emphasis and set forth in the President's first report on marine sciences.

They concern:

- A new food-from-the-sea program as part of the war on hunger, including overseas demonstration projects utilizing fish protein concentrate.
- Immediate implementation of the Sea Grant program to strengthen education, applied research and information transfer.
- A new study for improved collection and dissemination of oceanographic data.
- Designation of the Chesapeake Bay as a model to study the effects of estuarine pollution and remedial measures.
- A pilot plan for offshore minerals exploration.
- An expanded ocean observation system to improve near-shore weather prediction for small boats and oil facilities, and accuracy of long-range forecasting.
- A strengthened program of deep ocean technology, especially to develop a future capability to recover lost equipment.
- A new ship to accelerate research in sub-Arctic waters.
- Programs for international cooperation to promote peaceful use of the oceans.

Marine Sciences Budgets

To place these priority efforts in perspective, the Government's total activities in marine science and technology have also been examined, and the total recommended to the Congress for FY 1968 was $462 million, up 13 percent from the previous year. These funds are the minimum necessary to expand efforts to understand the sea and develop its resources, and to enhance capabilities of local government, universities, and private industry to join in this vital enterprise.

This $462 million, incidentally, represents less than three percent of the $17 billion proposed for FY 1968 for Federal research and development across the board. Considering the wide variety of purposes these funds must serve, we have endeavored this first year to improve overall effectiveness by deploying existing capabilities around a limited number of objectives. We are doing this by:

- Utilizing fully all the resources currently engaged in various facets of oceanography, public and private.
- Developing policies and coordinating programs to attain maximum effectiveness, without sacrificing distinctive imagination and initiative of each participant.
- Inviting fresh ideas from all sectors of our society.
- Fostering collaboration among Federal, state, and local entities, between the United States and other countries, and between public and private sectors.

Let me elaborate on the scope and content of several initiatives to illustrate how we have selected maritime

National Council on Marine Resources and Engineering Development

Chairman:
Hubert H. Humphrey, the Vice President

Members:
Dean Rusk, the Secretary of State
Paul R. Ignatius, the Secretary of the Navy
Stewart L. Udall, the Secretary of the Interior
Alexander B. Trowbridge, the Secretary of Commerce
John W. Gardner, the Secretary of Health, Education, and Welfare
Alan S. Boyd, the Secretary of Transportation
Glen T. Seaborg, Chairman, Atomic Energy Commission
Leland J. Haworth, Director, Science Foundation

Observers:
James E. Webb, Administrator, National Aeronautics and Space Administration
S. Dillon Ripley, Secretary, Smithsonian Institution
William S. Gaud, Administrator, Agency for International Development
Charles L. Schultze, Director, Bureau of the Budget
Gardner Ackley, Chairman, Council of Economic Advisers
Donald F. Hornig, Director, Office of Science and Technology

Executive Secretary:
Edward Wenk, Jr.

Figure 1.

activities which contribute to national goals, and how programs and agency responsibilities were developed.

Problem: Hunger

The problem of a world population that out-paces food production impinges critically on our nation's interest and, consequently, the United States has a long-standing policy to wage war on hunger.

Every possible approach is required to correct the world protein deficiency. The food-from-the-sea program is a new effort to bring fish protein to undernourished people. The fisheries potential of the sea as a protein source has been recognized for many years, and it now provides a new opportunity for the United States to provide world leadership in combatting one of the most compelling problems facing mankind. This program is a plan for action that could be developed promptly and economically, with available or emerging technologies and within the framework of existing institutions. It should also upgrade and assist domestic fisheries and fish processing industries through the development of markets for species not now commercially caught and for new products, and through an expanded knowledge of the fishery stocks of the world oceans.

Problem: Defense

A second area of increased emphasis relates to the capability of our Navy to operate in the deep oceans. This initiative must be considered in the perspective that defense will continue to present a major requirement for ocean sciences and engineering. Such requirements anticipate that future strategic forces are likely to rely heavily on ocean-based systems, and that we need to continue updating anti-submarine capabilities. Both operations are intrinsically limited by the understanding of environmental conditions which affect performance of surveillance sensors and weapon systems.

Program for Marine Sciences and Technology
Summary by Major Purpose

(In millions)

	Actual FY 1966	Estimated FY 1967	President's Budget FY 1968
International cooperation and collaboration	$ 5.1	$ 7.1	$ 7.4
National security	125.4	179.7	191.6
Fisheries development and seafood technology	38.7	51.5	49.2
Transportation	10.4	19.2	27.8
Marine pollution abatement and control	8.4	8.5	9.5
Health	5.1	6.6	4.2
Minerals, chemicals, water and energy resources	3.8	5.4	5.8
Recreation	10.3	11.5	13.6
Shore stabilization and protection	1.2	1.5	1.7
Multipurpose activities:			
Oceanographic research [1]	71.6 [2]	55.0	73.2
Education	2.2	3.3	5.5
General purpose ocean environmental observation and prediction services [3]	13.7	15.6	21.1
Mapping, charting and geodesy	32.3	33.7	39.1
General purpose nuclear power engineering development	3.5	8.7	10.5
National data centers	1.7	1.8	2.1
Total	$333.4	$409.1	$462.3

[1] Research beneficial to more than one of the headings above.

[2] Includes Project Mohole which was discontinued in FY 1967.

[3] Activities supporting more than one of the major purpose categories.

Operations at great depths are related to broad defense objectives. Both the loss of the USS Thresher and the loss of an unarmed nuclear weapon near Spain revealed limitations of our deep ocean engineering capability. Current Navy efforts in deep submergence, both for the recovery of lost equipment and to provide a general deep ocean engineering capability, are thus being strengthened.

Problem: Data

A third area concerns upgrading of the nation's oceanographic data system. The national flow of information from collector to consumer is the life of marine research. Data and its handling must meet the needs of users. Data can help scientists to understand complex ocean phenomena, marine life and the ocean/atmosphere interaction, and technologists to apply knowledge to many practical ends.

Problem: Education

A fourth area of special emphasis derives from the National Sea Grant College and Program Act of 1966. This legislation is aimed at advancing education, training, applied research and information transfer—in phase with accomplishment of the overall purpose of a viable marine sciences activity. The National Science Foundation is administering the program, the only operating program created by the contemporary marine sciences legislation.

Problem: Sub-Polar Work

As a final example of our areas of special emphasis, the council recommended utilization of a proposed replacement vessel for the ice patrol in sub-polar oceanographic research. This particular research field has been somewhat neglected. It requires special instruments and ice traversing capabilities. The Coast Guard proposed that the replacement ship for the over-age Evergreen could simultaneously be equipped as a specialized vessel for work in these regions, while serving its patrol functions. The Congress has postponed this item, which we hope will be taken up later.

Since formulating these FY 1968 recommendations, the council has studied a number of separate policy and program issues. Those made public concern such matters as the marine resources resolution introduced last fall at the United Nations General Assembly, calling for examination by the Secretary General of international marine science activities; initiatives for Latin American cooperation, announced by President Johnson at Punte del Esta; a joint study by the Departments of Interior and Transportation concerning Torrey Canyon-type pollution incidents; a recommendation that the Navy's Transit satellite system be made available for oceanographic and commercial ships, and that the Department of Transportation be assigned responsibility to develop plans for an updated national navigation plan for civilian use.

Search for Solutions

In accordance with terms of the legislation, the council has initiated a number of legal studies to analyze the current framework of international and domestic law that affects sovereignty on the seas and development of their resources. We are examining implications of possible changes to such legal regimes as they would help serve our national interests by advancing the objectives of the Act.

We are now looking ahead to the next fiscal year. Our present studies will affect the future course and speed of the nation's program in marine sciences for almost the next two years.

In the international area, we are considering how other nations may join the United States with funds and manpower for joint exploration of the sea. Both the developing and the developed nations can contribute and benefit from these activities. We are examining which programs can best benefit from these activities. We are examining which programs can best be conducted in concert with other nations, and whether individual programs should be on a bi- or multi-lateral basis.

We are considering the appropriate role of the Federal Government in relation to states. Detecting a widespread and spontaneous surge of local initiative, we are examining means by which local areas may analyze their special problems and coordinate their local interests with those of the Federal Government.

We are examining Government/industry roles and relationships, especially to encourage private initiative to develop resources on public lands of the continental shelf.

Advisory Role

The council operates as a board of advisors to develop recommendations for the President. Issues and action alternatives are based on working papers reaching it through the council secretariat. These may be initiated in one of the member agencies, through outside studies, or by the council staff. Advice and new ideas are also solicited from authorities in various fields who serve as consultants, from the many varied groups of our marine sciences community, such as the National Academy of Sciences, National Academy of Engineering, numerous professional groups, and governors and state planning officials.

Where policy or program activities cross agency lines and are of continuing nature, it has been desirable to develop proposals for council action through a committee structure. These have been established on a selected basis as the minimum necessary to achieve purposes of the council. These committees concern:

- Marine research, education and facilities.
- International affairs.
- Exploration and environmental prediction services.
- Multiple uses of the seashore.
- Food from the sea.

The Federal Government's program can be regarded as the sum of its parts. But with Presidential and Vice Presidential leadership to develop goals and provide a new momentum to the overall effort, to minimize effects of duplication and, especially, to take advantage of fresh ideas that may have in the past fallen in the gaps between agencies, we are striving to make the total effort more than the previous sum of the parts.

We are beginning to sharpen the tools for this purpose; to expand our knowledge of the marine environment; to utilize the advanced technology associated with a highly industrialized society; to develop the manpower and mobilize resources for a comprehensive, ocean-based program; to establish a framework of law that will facilitate work on the continental shelf and in the deep oceans; and to draw together, as partners, Government, industry, and the academic community. In the past, they have proven a strong, vibrant team in the development of this nation's present status as a world power.

Program Plan of Federal Agencies for Marine Sciences and Technology

(In Millions)

Agency	FY 1966 Actual	FY 1967 Estimate	FY 1968 Estimate
Department of Defense	$174.9	$235.8	$258.7
Department of the Interior	56.5	71.2	72.3
National Science Foundation	47.7[1]	29.0	40.1
Department of Commerce	25.0	32.5	36.0
Department of Transportation	8.1	10.8	24.6
Atomic Energy Commission	8.3	13.7	15.8
Department of State	5.0	5.1	5.4
Department of Health, Education and Welfare	5.4	7.0	4.8
Agency for International Development	.1	2.0	2.0
Smithsonian Institution	1.5	1.6	1.8
National Aeronautics and Space Administration	.9	.4	.8
Total	$333.4	$409.1	$462.3

[1] Includes Project Mohole which was discontinued in FY 1967.

Oceanography's Role in Defense

Rear Admiral O. D. Waters Jr., USN

The oceans that cover most of our globe have always been with us. In all probability life began there. So it is perhaps a little odd that in this latter day of multiplying marvels, there are few areas of scientific endeavor that have so whetted the imagination of men and the curiosity of scientists as the newly burgeoning field of oceanography.

Perhaps it is because almost every new discovery in the spreading realm of the ocean sciences has an almost immediately useful application, and many of them significantly affect our country's political, economic and military posture.

At the highest level, national welfare and national defense are inseparable but, in discussing the Defense Department's quarter-billion dollar oceanographic program, this article will confine itself to its military aspects. The fall-out benefits of this program to the nation's welfare are many, *e.g.*, increased food supplies, new drugs, improved recreation facilities, unlimited fresh water, better weather predictions, to name a few.

To the Navy, which is understandably DOD's executive agency in this area, oceanography embraces that body of science, technology, engineering and operations needed to exploit the oceans and their boundaries for our defense and related national objectives.

This mission involves many things. We explore and chart the oceans and coasts of the world. We examine not only the ocean floor but the subbottom as well. We examine the water itself for better knowledge of all the properties that affect our operations. (Sea water is not a simple fluid.) We study all phases of underwater sound propagation and the way it is affected by the air/sea and bottom/sea interfaces. We are deeply interested in marine biology for the way it affects sound propagation, and the way certain classes of marine life affect the performance of both our men and our equipment. We are trying to learn more about the variable interaction that takes place at the interface of ocean and atmosphere. We have a major interest in ice, its formation, and its movements. We are ceaselessly concerned with the ocean's dynamics, its tides, and its currents.

These and other environmental studies, too numerous to list here, are just a means to what we need to accomplish.

We are developing materials that resist fouling and corrosion. We are developing other materials capable of withstanding the enormous pressures of ocean deeps—one of the more promising materials in this area is glass. Mindful of the USS Thresher disaster, we are developing search and rescue vessels for distressed submarines and deep search vehicles to survey the ocean floor. We are developing new means of propulsion for these submersibles, including a nuclear power plant for the forthcoming deep submergence research and ocean engineering vehicle, the NR-1.

RAdm. O. D. Waters Jr., USN, is the Oceanographer of the Navy with full responsibility for all the Navy's oceanographic programs, including basic and applied research, ocean engineering and fleet support. Before the consolidation of the Navy's oceanographic programs under one office, Adm. Waters served as Navy Oceanographer in the Office of the Chief of Naval Operations and as Commander, Naval Oceanographic Office, Suitland, Md.

At the same time we are developing equipment and techniques to extend man's ability to do useful work as a free diver right up to his physiological limits, which we think will extend to a thousand feet in the next few years. This diving effort is backed by a parallel program in underwater medicine.

To support all these efforts, we are developing, with the help of independent research and development on the part of U. S. industry, new instrumentation, data collection systems, and navigation systems. The geodetic satellite, which ties the world together, is a Navy program.

Additionally, we have traditional responsibilities concerned with safety at sea. These include the production and distribution of charts and various publications for the use of the Fleet and the merchant marine, and the issuance of a variety of ocean environmental forecasts and notices of hazards to navigation. We also carry out certain salvage operations, such as the recovery of the unarmed nuclear bomb off Palomares, Spain.

In support of these activities, there are 31 surface ships, one submarine and five aircraft assigned to the Navy's oceanographic program. Some of these ships are highly specialized, such as the Mizar which is reinforced for ice operations and has a center well for lowering massive equipments into the sea. In addition, a 3,000-ton catamaran research ship is being operated on a contract basis.

Not all of the ships in the oceanographic program are directly operated by the Navy. Several are made available to major university laboratories where they are employed on Navy projects. Other ships, belonging to these laboratories, are utilized by the Navy and, on an opportunity basis, fleet, commercial and Coast Guard units are employed in oceanographic efforts.

Special platforms, such as Alvin, Flip (the ship that stands on end in the water), various towers and even an ice island are used. Submersibles and surface ships, developed and owned by industry, are leased as needed.

Oceanographer of the Navy Organization and Mission

To insure the effectiveness of the activities of the oceanographic program, and to avoid any duplication of effort, the Navy took steps just a little more than a year ago to streamline its entire oceanographic organization.

The Office of the Oceanographer of the Navy was established to direct the oceanographic program for the Chief of Naval Operations, with policy direction coming from the Secretary of the Navy. The Secretary's order gave the Oceanographer centralized authority, including control of the budget. From a budgetary standpoint, the Navy's oceanography program includes parts of 27 separate program elements, 70 budget line items, and seven Congressional appropriation categories. There are larger DOD programs which are concerned with only one element.

The organizational structure of the Office of the Oceanographer of the Navy (see page 16) separates the program into three main management areas:

- Science—under the Assistant Oceanographer for Ocean Science.
- Engineering—under the Assistant Oceanographer for Ocean Engineering and Development.
- Operations—under the Assistant Oceanographer for Ocean Operations.

The Assistant Oceanographer for Ocean Science is responsible for a broad scientific and technical program involving support of over 1,000 scientists and engineers at more than 100 academic and institutional facilities throughout the country, and within a dozen Navy laboratories. The program, totaling $43 million in FY 1968, provides a broad base of knowledge about the ocean environment upon which naval systems are developed and perfected.

The Assistant Oceanographer for Ocean Engineering and Development is responsible for activities which affect not only military capability but all activities under the sea. His efforts are designed to give the Navy a capability to operate at any depth, location and time within the ocean. Some of the projects included in this effort are:

- The Deep Submergence Systems Project concerned with the development of submarine escape, location and rescue; small object location and recovery; large object salvage; and increased diver working ability (Man-in-the-Sea). It also includes the efforts on the deep nuclear research submarine, the NR-1, and on the Trieste.
- The Deep Ocean Technology Project, an advanced development effort in ocean engineering and technology, covering such things as power sources, materials and structures, sensors, and sea floor engineering. The results of this development will have a major impact on all underwater work for whatever purpose. It is the area within DOD with perhaps the greatest potential benefit to the nation's non-military needs.
- A biomedical research effort of major proportions, lest the accomplishments in undersea technology outstrip man's ability to use them.
- A wide range of exploratory development programs in materials, power packages, and other engineering areas.
- An advanced development effort in support of marine environmental prediction.

The budget of the Ocean Engineering and Development component totals $97 million for FY 1968. A major portion of this effort is performed under contract to industry. Over 20 Navy laboratories and medical facilities, however, play a major role both in exporatory development and in managing industrial efforts.

The Assistant Oceanographer for Oceanographic Operations is responsible for a great variety of oceanographic, geophysical and hydrographic surveys, conducted in all ocean areas to obtain critical environmental data. This component is responsible also for the production and dissemination of charts, publications, and environmental forecasts, necessary to support key naval operations including Vietnam. It also

The USNS Elisha Kane was built for oceanographic surveying and research. This ship is part of the Navy's growing oceanographic fleet under the direction of the Oceanographer of the Navy.

gives technical direction to the oceanographic support so necessary to many salvage operations.

The program of the Assistant Oceanographer for Oceanographic Operations totals $109 million for FY 1968. It is concentrated at the Naval Oceanographic Office, and in the ocean environmental prediction sections of the Naval Weather Service Command.

The Role of Oceanography in Anti-Submarine Warfare

Oceanography is not to be confused with anti-submarine warfare (ASW), nor the Polaris system, nor amphibious or mine warfare operations. Oceanography is a necessary support element in all of the warfare areas, and it is also necessary to almost every waterborne weapon and surveillance system.

ASW is our primary object of support, for many of its systems are highly dependent upon the environment. As a minimum estimate, 50 percent of the oceanography program is directly applicable to the ASW area. Since much of this effort has multiple applications, ASW-oriented effort benefits other areas, and ASW is also frequently the indirect beneficiary of projects oriented toward other requirements. As an example of this latter case, I refer again to the Deep Ocean Technology Project. Its objective is to establish a broad base of undersea technology in order to allow development of options for future weapon systems of all types. It is conceivable that, at some time in the future, an ASW barrier network could exist on the sea floor in waters three or four miles deep, and that its existence would be made possible by a series of breakthroughs in an apparently unrelated engineering area. In effect, oceanography supports seapower, and it is unrealistic to exclude activities in this program from any specific warfare area.

A great deal is already known about the environment's effect on ASW systems, and this knowledge serves as the basis for operational surveys and the products which are furnished the tactical commander. There is a great deal more to be learned, and an urgency for such knowledge. It must be remembered that there is a constant evolution of new weapon systems, each of which may require either different environmental knowledge, or such knowledge to a different degree of accuracy or greater scope.

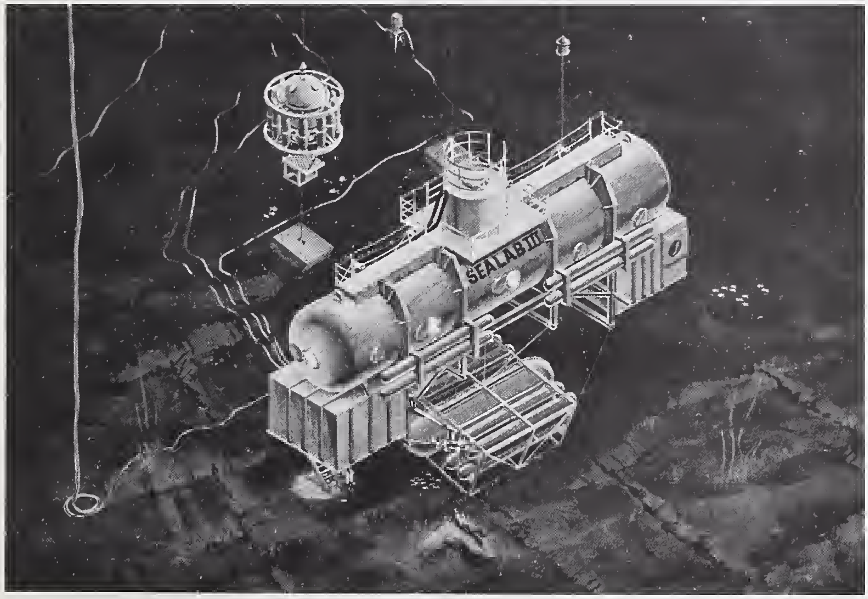
Underwater Acoustics

Underwater acoustics is the bread and butter of direct ASW oceanographic support. We are concerned with determining the influence of environmental factors upon sound propagation in the ocean. Our ultimate goal is to predict the performance of each of our sonar systems in all areas of the world. We investigate sound propagation, how it relates to the temperature and chemical structure of the water mass, and the masking of submarine echoes caused by reverberation from the bottom or from fish in the water. We also study the natural sounds of the sea which may mask our sound signals. In the early stages of this sonar work, it was recognized that the ocean bottom largely controlled the sonar's performance, and also that the sound transmission properties of the bottom varied greatly.

Fortunately, these variations can be directly correlated with the bottom sediments and topography. Our Marine Geophysical Survey Program is now sampling these properties throughout 16 million square miles of potential operating areas.

In many areas it can be predicted that the sonar will work very well. In a few very bad locations, it will not work reliably in the bottom bounce mode. Charts are being prepared indicating the exact type of performance which can be counted upon. The geology is the key to equipment performance in the bottom bounce mode. Highly reflective, smooth sediments enhance performance, while highly absorptive sediments attenuate the signal, and a very rough bottom causes excessive reverberation and masks submarine echoes. It is not just the bottom layer, but the several layers of the sub-bottom which may come into play, depending on the composition, grazing angle, frequency and other factors.

An attempt is being made to anticipate at least all near-term requirements for sonar and surveillance system support with environmental data by launching a comprehensive ASW, as well as undersea warfare survey program, which will collect data on the sea, the sea floor, and the sub-



Artist concept of the Navy's SEALAB III habitat. Up slope from the habitat is the device used as a pressurized elevator to ferry the aquanauts to and from the surface and ocean bottom.

bottom on a broad spectrum, and to the highest accuracy the state of the art permits. This information will serve not only to upgrade the performance of existing ASW systems, but will furnish guidance for future sonar and other system design and aid in the cost-effectiveness analysis of planned or proposed systems.

Ocean Environment Prediction

Besides the global survey of critical areas, we face the problem of prediction of time variable factors, such as layer depth, sea surface temperature, ice coverage, thermocline gradient, sea state, current boundaries, upwelling areas, and many others. For these predictions the tactical commander wants a tailored product, rather than a general purpose forecast from which he must extrapolate or refine the information.

The Naval Weather Service Command has in operation now a global network for the collection and processing of raw data and the dissemination of forecasts. The communications net is tied to a computer complex, and much of the procedure is automated. The products are even now quite useful and, considering the current sparsity of input data and the youth of the operational forecasting system, their potential value is tremendous. As part of the evolution of the system, there is now in an advanced state of development the Anti-Submarine Warfare Prediction Service (ASWEPS) for which data are collected on water temperature, sound velocity structure, surface wave actions and meteorological conditions. These are fed into the Naval Weather Sea Service Command systems on both coasts.

These scientific data are then converted into tactical guidance, such as probable sonar detection range, best depth for variable depth sonar, and optimum patterns for sonobouys. The unique aspect of this service is that it provides an on-the-spot picture of the ocean environment, plus the ability to predict it.

For instance, if a convoy commander should take the most direct route to his destination, he would have been in water favorable to him only 18 percent of the time. By making minor deviations, following the tongues of warm and cold water, he could very well change the odds and stay in water favorable to him for 36 percent of the time, and unfavorable only 13 percent. In complex water areas, the ASWEPS system can improve sonar capability by a factor of two over a random track selection.

The temperature prediction charts, which come from the Navy's system, are also applicable to non-military work, and are being used by the Interior Department for use in fisheries prediction.

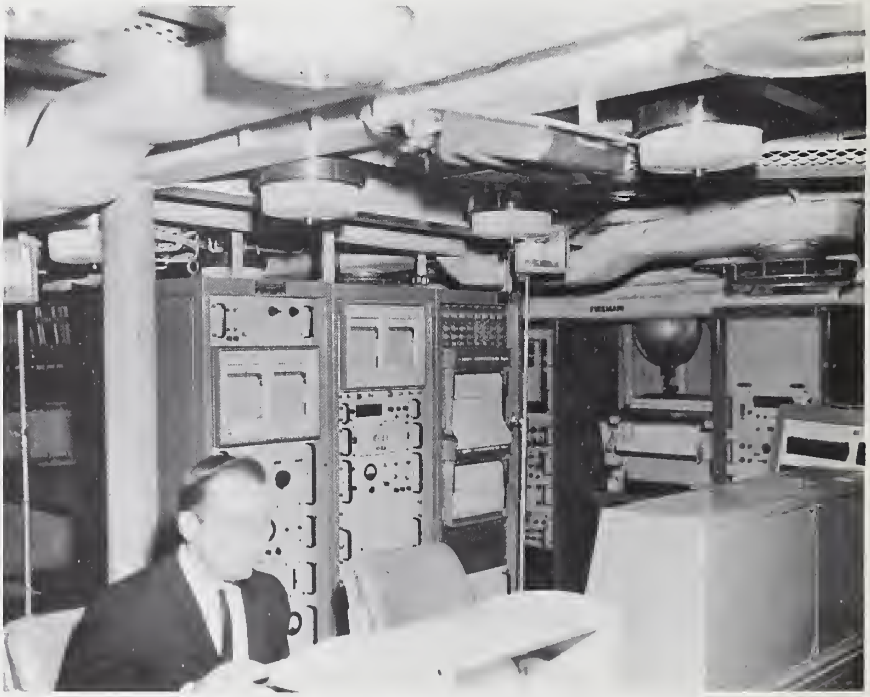
A major field program will commence next summer to study large scale sea surface temperature anomaly patterns as they generate and propogate across the North Pacific Ocean. Part of the instrumentation developed to support the program is the Monster Buoy. This 40-foot diameter buoy has been developed as a fixed-ocean data station. It is capable of measuring as many as 100 individual meteorological and oceanographic parameters, and transmitting the data over distances as great as 2,500 miles. Though developed to acquire scientific data for an ASW research effort, its development has been utilized by the Coast Guard by adaptation to allow its use as a replacement for lightships. Scotland lightship, off New York, is the first such replacement.

Other equipment, developed as part of the prediction efforts, includes the Shipborne Expendable Bathythermograph (BT), the first major advance since the BT was invented in World War II; automated sea-surface temperature devices; and an airborne infrared sea surface temperature sensing system. All of these have found or are finding their way into tactical ASW use. Other equipments, such as an airborne expendable BT, are now being developed.

One of the most successful prediction developments was the Optimum Ship Track Routing System, now used by over 800 ships/month in the Pacific alone. This system forecasts and weighs all the environmental conditions between the point of departure and the destination, and recommends the safest, fastest route.

Other ASW Support Efforts

Another area which must be considered in ASW is marine biology, for marine organisms not only foul sonar equipments but they reflect as false targets. In organic concentrations known as the deep scattering layer, present over much of the world, they mask submarine echoes. A deep submersible is being used to identify the organisms and study their



The Shipboard Survey System, onboard the USNS Silas Bent, digitizes, corrects, linearizes, arranges, displays and plots data from a large assortment of underway and on-station measuring devices.

acoustic characteristics. By learning more about the geographic and seasonal distributions of these layers, we hope to be able to better predict and avoid their influence upon the detection capabilities of fleet units.

Geophysics is another area of concern. Submarines on barrier patrol may utilize inertial navigators for precise navigation, and the effect of gravity anomalies can force serious errors into those equipments unless the anomaly value is known. The problem is most severe in the Pacific, where the bathymetry is more variable than in the Atlantic operating areas. In areas near deep ocean trenches, the variations can run as much as 600 milligals over a 100-mile line. These changes in gravity give rise to a deflection of the vertical as large as 60 seconds of arc, with resulting position errors of over a mile.

We are committed to gravity surveys at sea for several programs, and have several ships so assigned. In addition, much gravity data and many of the measuring techniques and equipment concepts come from the academic program. Magnetics is likewise of major interest, for local anomalies can act as false targets to Magnetic Anomaly Detection (MAD) ASW systems. We are engaged not only in determining the anomalies, but in research to eliminate the background noise interference

Other projects are being carried forward to develop various non-acoustic, environment sensitive means for the detection of both nuclear and non-nuclear submarines. The influence of internal waves on ASW is not yet well defined, nor are the waves themselves. The Arctic presents its own special problems to ASW, for obvious reasons, and we are looking at that area with increasing interest. The Navy, through the University of Alaska, has a major research laboratory on the shore of the polar sea at Point Barrow from which to launch its projects.

The oceanography program can have a long-term effect on ASW problems of a potential enemy. Every time we add 100 feet to the maximum operating depth of a submarine, we add millions of miles to its volume. The submersibles, being developed for research and survey of the deep ocean floor, will most certainly have some developments beneficial to combat submarine design and construction.

The ocean is our medium and the knowledge, which allows us to exploit it best, gives us an advantage over an adversary not so well equipped. Oceanography, in its broadest sense, is the attainment of that knowledge.

There is no sector of our national life that has a bigger potential role to play in oceanography than has private industry.

The Defense Department has accepted national responsibility in the field of ocean technology, which I mentioned earlier, and we are turning, of necessity, to industry to develop and build the vehicles, the installations and the instruments that we must have for our expanding deep ocean operations. Many American firms are already at work in this area.

However, there are large opportunities outside of defense work and outside of the Government itself.

The oil industry has lead the way. Sixteen percent of the world's oil already comes from beneath the water. Federal revenues from oil, taken beyond the three-mile limit, exceeds the entire cost of the Defense Department's oceanographic program.

The Geneva Convention, signed in 1964, opens up other vistas. By this treaty we acquired exportation rights to the continental shelf out to the 200-meter line—in certain circumstances, beyond that. Thus, in one stroke, we acquired a territory larger than the Louisiana Purchase and, perhaps, more valuable.

Manganese, iron, titanium, zirconium, chromium, tungsten, sulphur, phosphate, magnesium and bromine —even gold and diamonds—are just some of the minerals and chemicals recoverable from the oceans as soon as growing shortages on the land make the operation profitable. In some cases, that time is now.

We know how to process fish meal concentrate for animal food and fertilizer, and this product, made from the so-called trash fish, has lately been refined to a point where it offers an inexpensive food source for protein-starved populations all over the world.

These are a few highlights, but enough I hope, to make it clear that Government and industry must make common cause to assure American leadership in the whole field of oceanography for the sake of our political and economical survival.

The importance of man living and working as a free agent in the ocean environment is increasing. Many oceanographic instruments must be installed and maintained by divers.

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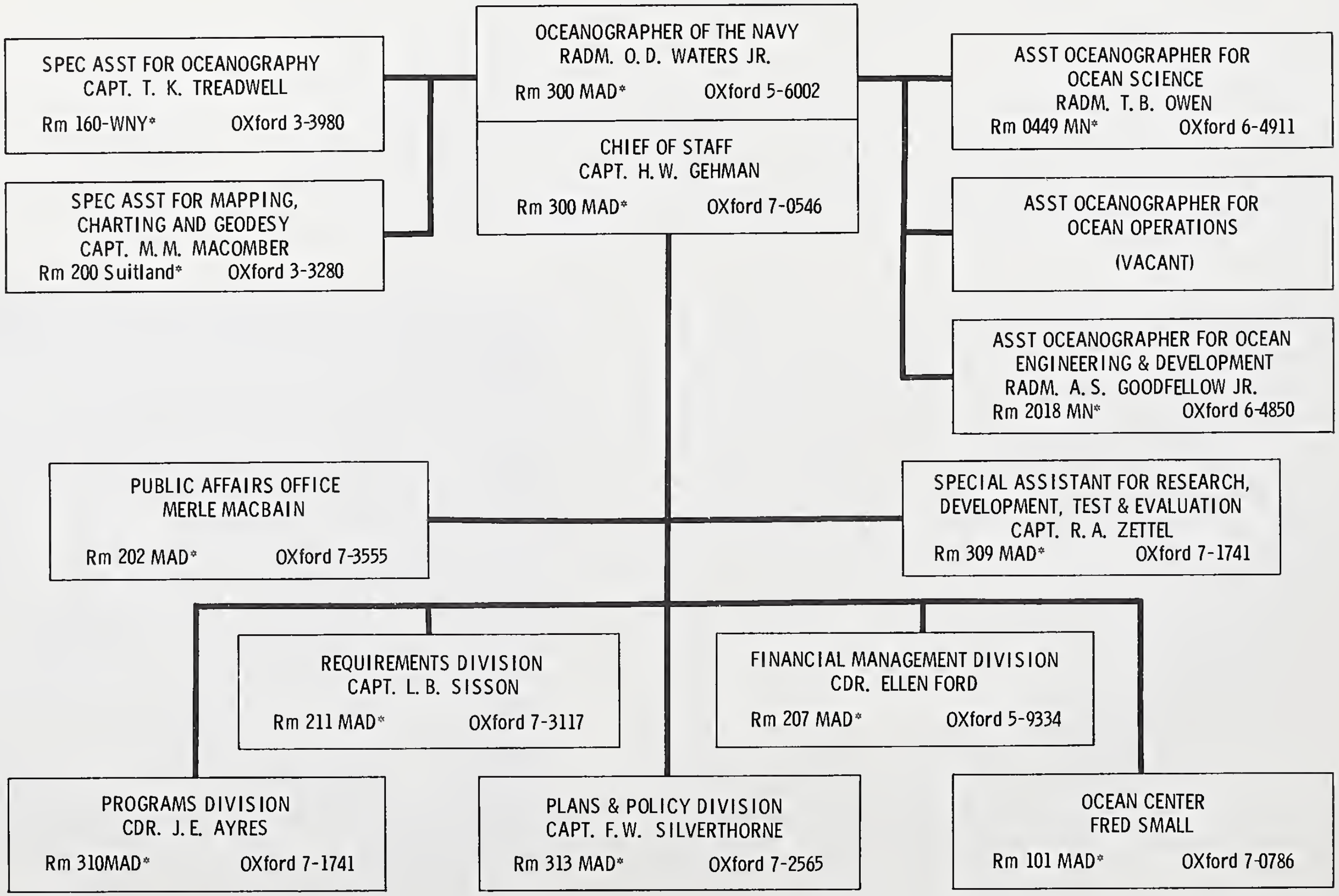
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DECEMBER 1, 1967

Contemporary Principles of the International Law of the Sea

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Head, Law of the Sea Branch
International Law Division
Office of the Judge Advocate General of the Navy

[Editor's Note: The following article is reprinted from the JAG Journal, *published by the Office of the Judge Advocate General of the Navy. The objective of the* JAG Journal *is to acquaint naval personnel with matters related to the law and to bring to notice recent developments in this field. The views expressed in the articles must be considered as the views of the individual authors, not necessarily bearing the endorsement or approval of the Department of the Navy, the Judge Advocate General of the Navy, or any other agency or department of the Government.]*

It is not uncommon today to hear laymen—and surprisingly, even some lawyers—speak of the oceans as a no man's land where there is no law. As most would agree, nothing could be further from the truth. Indeed, the history of the law of the sea must be measured not in centuries but in millennia. Our modern law of the sea finds its roots in the famous Maritime Codes which are themselves as old as the great seafaring empires of Europe and the Near East. By a complex process of adoption, adaptation and, where necessary, invention, civilized men have always carried law with them whenever they ventured from their homeland.

As has been observed, the traditional law of the sea developed in response to a three-dimensional concept of seapower. Previously, seapower revolved around one central and overwhelmingly important use of the oceans—communications. For some nations, such as Great Britain, oceanic navigation was so vital as to become the central theme pervading their entire foreign policy for many centuries. Even today, the oceans represent the most important avenue of trade and commerce for most nations. Right now—well over a half century since the advent of the airplane—99 percent of United States overseas trade moves by ship.

This dependence of many nations on seaborne communications resulted in the development of what could be termed a policy of "reciprocal restraints." This policy manifests itself in the much-used and abused legal doctrine of "Freedom of the Seas." Well after the principle of territorial sovereignty emerged as the dominant principle of jurisdictional organization on land, the maritime nations abandoned their attempts to extend this principle onto the vast oceans. Instead, three basic principles emerged with respect to the high seas:

(1) All nations have an equal right to use the high seas.

(2) One nation may not unreasonably interfere with the lawful use of the high seas by another.

(3) Each nation has jurisdiction over activities conducted on the high seas under its flag or nationality.

These basic principles were confirmed by the 1958 Convention on the High Seas, which explicity states that its provisions are generally declaratory of established principles of international law.[1] At present, 38 states are parties to this Convention, including the United States, Great Britain, the Soviet Union, and many other maritime nations. Article 2 of the Convention provides:

> **The high seas being open to all nations, no State may validly purport to subject any part of them to its sovereignty. Freedom of the high seas is exercised under the conditions laid down by these articles and by the other rules of international law. It comprises, *inter alia*, both for coastal and non-coastal States:**
>
> **(1) Freedom of navigation;**
>
> **(2) Freedom of fishing;**
>
> **(3) Freedom to lay submarine cables and pipelines;**
>
> **(4) Freedom to fly over the high seas.**
>
> **These freedoms, and others which are recognized by the general principles of international law, shall be exercised by all States with reasonable regard to the interests of other States in their exercise of the freedom of the high seas.**

The principle of freedom of the seas, as the text of the Convention reveals, could be more accurately called the freedom of the high seas, for it is only the high seas which are free. The term "high seas" is defined by the Convention to mean "all parts of the sea that are not included in the territorial sea or in the internal waters of a State." [2]

Internal waters are, in a legal sense, the exact opposite of the high seas. They are completely subject to the territorial sovereignty of the coastal state, which has as much control over them as it has over its land territory. All waters lying landward of the *baseline* from which the territorial sea is measured are internal waters.[3] The baseline generally follows the low-water mark along the coast.[4] In addition, a state may draw its baseline along a straight line of any length across the mouth of a river which flows directly into the sea.[5] Closing lines of unlimited length may also be drawn across the entrance to so-called historic bays; but across the entrance of other bays closing lines cannot exceed 24 miles.[6] Finally, pursuant to the decision of the International Court of Justice in the *Anglo-Norwegian Fisheries Case,* under exceptional circumstances other sea areas closely linked to the land domain may be enclosed as internal waters by a system of "straight baselines" where the coast is deeply indented or where there is a fringe of islands laying immediately off the coast.[7]

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[1] Convention on the High Seas, April 29, 1958, in force Sept. 30, 1962, 13 U.S.T. 2312, T.I.A.S. 5200, 450 U.N.T.S. 82 (hereinafter High Seas Convention), preamble.

[2] *Id.*, art. 1.

[3] Convention on the Territorial Sea and the Contiguous Zone, April 29, 1958, in force Sept. 10, 1964, 15 U.S.T. 1606, T.I.A.S. 5639, 516 U.N.T.S. 205 (hereinafter Territorial Sea Convention), art. 5, par. 1.

[4] *Id.*, art 3.

The sovereignty of the coastal state extends also from this baseline to a narrow belt of sea adjacent to the coast called the "territorial sea."[8] The Territorial Sea Convention explicitly states that the sovereignty of the coastal state extends to the airspace over the territorial sea as well as to its seabed and subsoil.[9] The major legal difference between internal waters and the territorial sea is that ships of all nations have a right of innocent passage through the territorial sea, but generally not through internal waters.[10] From the standpoint of control over the mineral and biological resources, there is essentially no difference between the two regimes, although the means employed by the coastal state to exploit these resources in the territorial sea, particularly when it comprises an international strait, cannot unreasonably obstruct established routes of international navigation.[11]

The Territorial Sea Convention also authorizes a coastal state to establish a "contiguous zone" beyond its territorial sea in which it may exercise the control necessary to prevent and punish infringement of its customs, fiscal, immigration or sanitary regulations within its territory or territorial sea. The contiguous zone is a high seas zone which cannot extend beyond 12 miles from the baseline from which the breadth of the territorial sea is measured.[12]

It is important to note that the contiguous zone referred to by the Territorial Sea Convention is not a zone in which the coastal state exercises special competence over mineral or biological resources. Nevertheless, over 30 states have claimed exclusive or primary jurisdiction over fisheries in zones contiguous to their territorial sea. Last year, the United States itself declared jurisdiction over the fish resources of a high seas zone extending 9 miles beyond the outer limit of the 3-mile territorial sea.[13] The legality of these contiguous fisheries zones depends on customary law developed through the practice of states and not on any express provision of the 1958 Geneva Conventions.

It is significant that the classic rules of the international law of the sea did not give special attention to the seabed and subsoil of the oceans. It was generally assumed, however, that the established maritime zones extended down into the seabed and subsoil and up into the airspace. In fact, to the extent that this assumption conceded coastal state sovereignty over the seabed and subsoil beneath internal waters and the territorial sea,[14] and conversely implied that *all* states have a right to lay submarine cables and pipelines on the seabed beneath the high seas,[15] this assumption is today clearly established law.

Because of the inherent limitations of available technology, no great interest regarding the legal status of the seabed and subsoil under the high seas developed until recently. In the 19th century, England—herself the champion of freedom of the seas—did claim ownership of the pearl and chank fisheries under the high seas off the coasts of Ceylon and Bahrein on the grounds of uninterrupted and undisputed proprietorship of successive rulers over these areas since time immemorial.[16] But it was not until the middle of this century—not until the rich offshore oil deposits fell within the reach of an advanced technology—that any comprehensive attempt was made to establish the degree to which the principle of the freedom of the seas applied to the seabed and subsoil of the high seas.

The first move in this direction was the 1942 treaty between Great Britain and Venezuela concerning the seabed and subsoil of those portions of the Gulf of Paria which lay outside the territorial waters of either state.[17] The Gulf of Paria is an almost completely enclosed body of water surrounded on one side by the Venezuelan coast and on the other by the Island of Trinidad. The treaty established lines dividing the seabed and subsoil of the Gulf between Trinidad and the Venezuelan coast.[18] Each party agreed not to claim sovereignty or control in areas beyond that line and to recognize "any rights of sovereignty or control which have been or may hereafter be lawfully acquired" by the other party.[19] The treaty explicitly states that it in no way affects the status of the waters of the Gulf or any right of navigation.[20] As important as the treaty is as a precedent in this field, it had specific application and did not purport to represent a policy of either state with regard to submarine areas generally. The announcement of such a comprehensive policy was to come a mere 3 years later from Great

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[5] *Id.*, art. 13.

[6] *Id.*, art. 7.

[7] Fisheries Case (United Kingdom v. Norway), [1951] I.C.J. Rep. 116; Territorial Sea Convention, *supra* note 3, art. 4.

[8] Territorial Sea Convention, *supra* note 3. art. 1, par. 1.

[9] *Id.*, art. 2.

[10] *Id.*, art. 14, par. 1. There is a right of innocent passage through areas enclosed as internal waters by the establishment of a system of straight baselines if the areas were previously part of the territorial sea or the high seas. *Id.*, art. 5, par. 2.

[11] See *id.*, art. 15, par. 1; art. 16, par. 4; Corfu Channel Case (United Kingdom v. Albania), [1949] I.C.J. Rep. 4; see also Convention on the Continental Shelf, April 29, 1958, in force June 10, 1964, 15 U.S.T. 471, T.I.A.S. 5578, 499 U.N.T.S. 311 (hereinafter Continental Shelf Convention), art. 5, pars. 1 and 6.

[12] Territorial Sea Convention, *supra* note 3, art. 24.

[13] 80 Stat. 908 (1966), 16 U.S.C. §§ 1091–94 (Supp. II, 1965–66).

[14] See *supra*, note 9.

[15] High Seas Convention, *supra* note 1, arts, 2 and 26; see Continental Shelf Convention, *supra* note 10, art. 4. This is the one enumerated freedom which, by its very nature, could not exist at all if the seabed and subsoil did not partake, at least to some degree, of the regime of the superjacent waters.

[16] "Who can doubt that the pearl fisheries of Bahrein and Ceylon may be lawful objects of ownership?" *Vattel, Droit des gens,* bk 1, sec. 287. "The justification for this prohibition against chank fishing from banks which at their furthest extend as far as 25 miles from the Ceylonese coast, is based on rights over the fisheries enjoyed in uninterrupted and undisputed proprietorship by successive rulers, native, Portuguese, Dutch and British, since a period prior to the development of the doctrine of the 3-mile limit." Mr. Ormsby-Gore, Under Secretary of State for the Colonies, May 2, 1923, 163 H.C. Parliamentary Debates, cols. 1417–18 (5th ser.); 2 *Hackworth, Digest of International Law* 679 (1941).

[17] Treaty Relating to the Submarine Areas of the Gulf of Paria, February 26, 1942, Brit. Treaty Ser., No. 10 (1942), Cmd. 6400; 1 *Laws and Regulations on the Regime of the High Seas* 44 (ST/LEG/SER.B/1) (U.N. Legislative Series, 1951). (Appendix A, *infra.*)

[18] *Id.*, art. 3.

[19] *Id.*, art. 2.

[20] *Id.*, art. 6. A similar statement was made by the British Under Secretary of State for Foreign Affairs on May 30, 1923 with respect to navigation and "ordinary" fishing rights on the high seas above the claimed pearl fisheries off Ceylon. 164 H.C. Parliamentary Debates, cols. 1261–62 (5th ser.); 2 *Hackworth, op. cit. supra* note 16, at 679.

Britain's successor as the world's leading maritime state.

On September 28, 1945, President Truman issued a proclamation which has already had the most significant impact on the development of the law of the sea of any single event in this century. On that date the President announced to the world that the United States regarded the natural resources of the subsoil and seabed of the continental shelf contiguous to its shores as being subject to its exclusive jurisdiction and control.[21]

By this proclamation, the resources of 750,000 square miles of underwater land were claimed by the United States—an area almost 3 times the size of Texas. The description of the claimed area contained in the press release accompanying the proclamation is significant because it not only indicates the magnitude of the area involved but also demonstrates that the claim was clearly limited to an area coextensive with the geologic continental shelf contiguous to the United States.[22]

After the Truman Proclamation, several other nations followed suit and claimed exclusive ownership of the natural resources of their continental shelves. The United States did not receive a single protest from any other state concerning the Truman Proclamation. Indeed, just 13 years later, the 1958 United Nations Conference on the Law of the Sea adopted the essential outlines of the United States proclamation and agreed, with surprisingly little debate in committee or at its plenary sessions, on the text of the Convention on the Continental Shelf.[23] As opposed to the Territorial Sea Convention and the High Seas Convention, which essentially codified long-established principles relating to well-known problems of communications and security, the Continental Shelf Convention laid the groundwork for a developing international law relating to the exploitation of seabed resources.

In order to discuss the Continental Shelf Convention, we must define the term "continental shelf." In simple geological terms, every continent is situated on a submarine base which extends seaward from the shore for a varying distance. This submerged extension of the land is called the "continental shelf." More specifically, it may be defined as the submerged portion of a continent *which slopes gently seaward from the low-water line to a point where a substantial break in grade occurs*, at which point the terrain slopes seaward at a steep grade until the great ocean depth is reached. The steep sloping area is called the "continental slope."

The continental shelf is a worldwide geological feature that is not peculiar to any one continent or any one hemisphere, although its distribution over the world is unequal. Along the coasts of the United States the width of the shelf varies from 1 nautical mile off parts of California to 250 miles off New England. In the Gulf of Mexico, near the Texas-Louisiana border, it has a width of 120 miles.

The continental shelf should not be confused with the waters overlying it—one is a land mass, under water, but land nevertheless; the other is a water area, sometimes called the "epicontinental sea." Keeping in mind the geological concept of the continental shelf, let us now turn to its legal definition as contained in the Convention on the Continental Shelf.

Article 1 of the Convention defines the continental shelf as the seabed and subsoil of the high seas areas adjacent to the coast, to a depth of 200 meters *or, beyond that depth*, to where the depth of the superjacent water permits the exploitation of the natural resources of such areas.[24] The coastal state is granted sovereign rights for the purpose of exploring, and exploiting the natural resources of, the area so defined.[25] But the water and airspace above retain their character as free high seas and free airspace.[26] Thus, the provisions of the Convention concerning the rights of coastal states closely parallel those of the Truman Proclamation.

The "natural resources" of the continental shelf are defined as the mineral and other non-living resources of the seabed and subsoil, and living organisms belonging to the sedentary species that are attached to the seabed at the time of harvesting.[27] Thus, natural resources are defined in such a way as to include oyster beds and pearl fisheries but to exclude such crustaceans as shrimp. In the view of the United States, the definition includes the king crab, which can get off the bottom only by jumping.

The Convention authorizes a coastal nation to erect installations on its shelf to explore and exploit these resources.[28] The exercise of this authority, however, must not result in any "unjustifiable interference" with navigation, fishing, or conservation of living resources.[29] Safety zones necessary for the protection of the installations may be maintained, and may extend a maximum of 500 meters around an installation.[30] All ships must respect these zones. However,

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[21] Proclamation No. 2667, Policy of the United States with respect to the Natural Resources of the Subsoil and Sea Bed of the Continental Shelf, September 28, 1945, 59 Stat. 884, 10 Fed. Reg. 12303 (1945) (hereinafter the Truman Proclamation). (Appendix B, *infra.*) No explicit attempt to define what is meant by "natural resources" is evident. The question presents itself as to whether any living resources were included. A July 19, 1944, draft of the Proclamation stated that "rights under international law with respect to free swimming fish are in no way thus affected," implying a contrary intent with respect to sedentary species. 4 *Whiteman, Digest of International Law* 753 (1965). See *supra* note 20. The only reference in the Proclamation to specific resources is to "petroleum and other minerals." There is also a reference to a "pool or deposit" of resources. The question acquires an added dimension when it is considered that a companion proclamation concerning high seas fisheries was issued at the same time. Proclamation No. 2668, Policy of the United States with respect to Coastal Fisheries in Certain Areas of the High Seas, September 28, 1945, 59 Stat. 885, 10 Fed. Reg. 12304 (1945). Secretary Ickes distinguished the primary functions of the two proclamations when he said, "Approximately described, the Continental Shelf is all of the ocean floor around the United States and its Territories that is covered by no more than 600 feet of water. * * * Two Presidential proclamations assert our sovereignty over the *mineral* resources of this ground, and our jurisdiction over the fishery resources of the high seas contiguous to our lands." *Annual Report of the Secretary of the Interior. Fiscal Year Ended June* 30, 1945, p. 9 (1945): 4 *Whiteman op. cit. supra, at 760 (emphasis added)*.

[22] The press release stated that the Truman Proclamation would "make possible the orderly development of an underwater area 750,000 square miles in extent. Generally, submerged land which is contiguous to the continent and which is covered by no more than 100 fathoms (600 feet) of water is considered as the continental shelf." 13 *Dept. State Bull.* 484 (1945). See *supra* note 21.

[23] Continental Shelf Convention, *supra* note 10. (Appendix C, *infra.*) "The Continental Shelf doctrine is well established in international practice and all the substantive articles of the convention were adopted by large majorities." Acting Secretary of State Dillon to President Eisenhower, letter of Sept. 2, 1959, 4 *Whiteman, op. cit. supra* note 21, at 867.

[24] Continental Shelf Convention, *supra* note 10, art. 1: "For the purpose of these articles, the term 'continental shelf' is used as referring (*a*) to the seabed and subsoil of the submarine areas adjacent to the coast but outside the area of the territorial sea, to a depth of 200 meters or, beyond that limit, to where the depth of the superjacent waters admits of the exploitation of the natural resources of the said areas; (*b*) to the seabed and subsoil of similar submarine areas adjacent to the coasts of islands."

[25] *Id.*, art. 2, par. 1.

[26] *Id.*, art. 3. The Truman Proclamation, *supra* note 21, contained a similar statement. See also *supra* note 20.

[27] Continental Shelf Convention, *supra* note 10, art. 2, par. 4.

[28] *Id.*, art. 5, par. 2.

(*Continued on Page 34*)

ABOUT PEOPLE

DEPARTMENT OF DEFENSE

Maj. Gen. George E. Pickett, USA, has assumed duties as Vice Dir., Defense Communications Agency (DCA). Gen. Pickett has been serving as Dep. Dir. for the Defense Communications System since his assignment to DCA in March 1965.

Dr. Louis M. Rousselot assumed the position of Dep. Asst. Secretary of Defense (Health and Medical) in the Office of the Asst. Secretary of Defense (Manpower) on Jan. 2, 1968.

Col. Edmund Czapski, USAF, has been assigned as Comptroller, Field Command, Defense Atomic Support Agency, Sandia Base, N. M.

New assignments in the Defense Supply Agency include: **Col. Orville L. Smiley, USAF,** Dir., Office of Data Systems, Defense Personnel Support Center, Philadelphia, Pa.; **Col. Robert McCormack, USAF,** Dir., Technical Operations, Defense Electronics Supply Center, Dayton, Ohio; **Capt. Carl J. Strienger Jr.,** USN (SC), Commander, and **Col. Carmon M. Anderson,** USAF, Dep. Commander, Defense Depot, Mechanicsburg, Pa.; **Col. Joseph J. Pounder Jr.,** USAF, Dep. Commander, Defense Depot, Tracy, Calif.; Col. **William B. Cannon,** USAF, Chief, Defense Contract Administration Services District, Garden City, N. Y.; and **Col. Robert W. West,** USAF, Chief, Defense Contract Administration Services District, Fort Holabird, Baltimore, Md.

DEPARTMENT OF THE ARMY

Brig. Gen. **William A. Becker** has been designated Dep. Commanding General, U. S. Army Combat Developments Command, Fort Belvoir, Va. He replaces **Maj. Gen. Julian J. Ewell** who has been assigned to duty in Vietnam.

Col. James C. Miller Jr. has been named Project Manager for the SAM-D (Surface-to-Air-Missile Development) at the U.S. Army Missile Command, Redstone Arsenal, Ala. He replaces **Col. E. M. Dooley** who has been assigned to the Sentinel System Project.

Leonard R. Ambrosini has been appointed Chief Systems Engineer for Hq., U. S. Army Weapons Command, Rock Island, Ill.

DEPARTMENT OF THE NAVY

The new Asst. Commandant of the U.S. Marine Corps is **Lt. Gen. Lewis W. Walt, USMC.**

RAdm. Roger W. Paine Jr. has been assigned Dir., Naval Information Systems Div., in the Office of the Chief of Naval Operations.

Brig. Gen. William G. Johnson, USMC, has replaced **Brig. Gen. Alan J. Armstrong, USMC,** as Asst. Dep. Chief of Staff (Air), Hq., U. S. Marine Corp. Gen. Armstrong has been assigned Dir., Marine Corps Landing Force Development Center, Marine Corps Schools, Quantico, Va.

Other new assignments in the Navy include: **Capt. Stuart M. Ball,** (SC), Commanding Officer, Naval Supply Center, Puget Sound, Bremerton, Wash.; **Capt. Robert E. Barnhart,** Commanding Officer, Pearl Harbor Naval Shipyard; and **Capt. Jack N. Miller,** Commanding Officer, Naval Training Device Center, Orlando, Fla.

Gen. Leonard F. Chapman Jr., USMC, has been sworn in as the 24th Commandant of the Marine Corps relieving **Gen. Wallace M. Greene Jr., USMC,** as commander of 300,000 U.S. Marines around the world. The new commandant was moved up from the post of Assistant Commandant and was promoted to four-star rank with the assignment. Gen. Chapman, 54, is a native of Key West, Fla. and is a 1935 graduate of the University of Florida. He has served in the Marine Corps for more than 32 years and, prior to being assigned as Assistant Commandant in July 1967, served as Chief of Staff, Headquarters, Marine Corps.

DEPARTMENT OF THE AIR FORCE

Thomas H. Nielsen, formerly President of the California Land Co. and Executive Vice President of the White Investment Co., has assumed duties as Asst. Secretary of the Air Force (Financial Management). He replaces **Leonard Marks Jr.** who resigned at the end of 1967.

Lt. Gen. William W. Momyer, Dep. Commander, Military Assistance Command, Vietnam, for Air Operations, and Commander, Seventh Air Force, Pacific Air Forces, has been promoted to the rank of general.

Brig. Gen. James D. Kemp will become Dep. Commander, San Antonio Air Materiel Area, Kelly AFB, Tex., effective March 1, 1968.

Other assignments in the Air Force Systems Command are: **Col. Leon S. Bogan,** Chief, Procurement and Production Div., Space and Missile System Organization; **Col. David J. Duff,** System Program Dir., Integrated Air Base Defense System, Aeronautical Systems Div.; **Col. David M. Falk,** Chief, AGM-69A Program Office, Aeronautical Systems Div.; **Col. James R. Finton,** Dir., Avionics Subsystems Engineering, Aeronautical Systems Div.; and **Col. Albert P. Lovelady,** System Program Dir., Life Support Systems, Aeronautical Systems Div.

1

2

1. "Operation Attleroro" by Gary Porter.

2. "A Patrol" by Edward Reep.

3. "Convent of Cherubusco" by James Walker.

5. "Medical Evacuation" by Sp4 Felix R. Sanchez.

U.S. Army Historical Collection Available for Exhibition and Reproduction

The almost 12,000 paintings in the U.S. Army Historical Collection represent the efforts of combat artists who have observed actions since the time of the Mexican War. Although the collection primarily consists of oils, watercolors and drawings from World War II, a limited number of paintings depict American military history before and since that period.

Today, in Vietnam, artists are once again documenting the impressions and activities of the soldier in combat. Nearly 1,000 pieces of artwork, with a wide range of subjects, have been produced by artists associated with the Army's Combat Artist Program.

The paintings, examples of which are reproduced on this page, are the property of the Department of the Army and are available for exhibition and publication. All inquiries, concerning their availability, selection and use, should be directed to:

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4

Deep Submergence Progress, Problems and Plans

Captain William M. Nicholson, USN

For more than 5,000 years man has used the oceans for food, for travel, for transport, for war and, especially during the past few years, for recreation. However, in these endeavors man has essentially been limited to the surface of the oceans, to the epidermis of the seas.

Man fishes from surface ships with nets and lines; he raises "seafood"—and comparatively little—in sheltered, shallow, coastal waters. His trading ships criss-cross the surface of the seas, and even his underwater ships, submarines, are limited to the near surface with a diving capability measured in hundreds of feet in an ocean which has a maximum depth of some 36,000 feet. Man is unable to effectively search for and recover small objects even in the relatively shallow waters, witness the three-month search and recovery effort for an H–bomb lost in 2,800 feet of water off Palomares, Spain, in early 1966.

During the past decade man has made greater strides in penetrating this "inner space" than he has in the previous 5,000 years. The U.S. Navy's part in this intensive effort to penetrate the ocean depths began on January 23, 1960, when the Navy bathyscaph Trieste, piloted by Lieutenant Don Walsh, USN, descended to a depth of 35,800 feet, the deepest known ocean depth.

The reasons for Navy interest and leadership in this field are many. The major advantages to be gained in exploiting the ocean depths are increased capabilities for underwater rescue, salvage, and construction; deep-sea search and recovery; antisubmarine operations; mine warfare; and amphibious warfare.

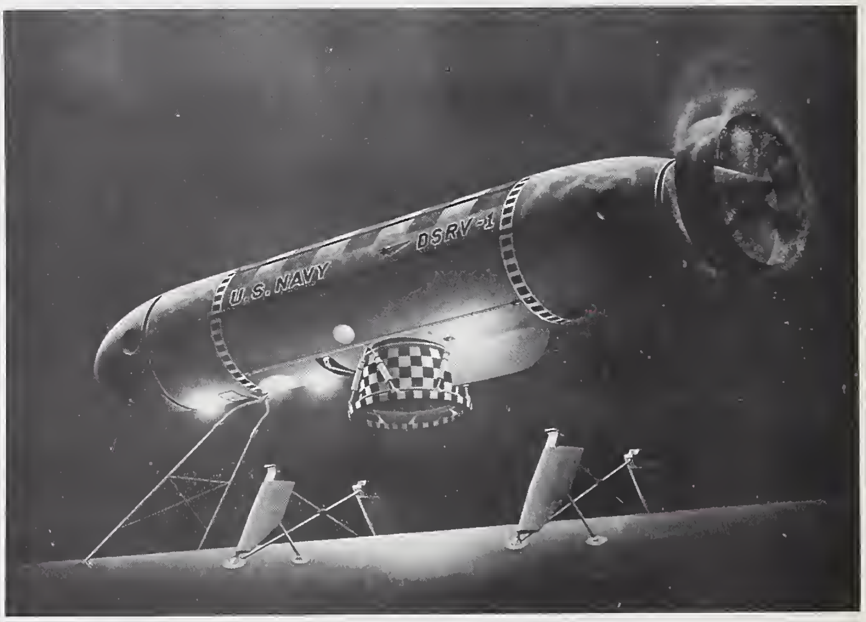
The Navy's main efforts in developing a deep submergence capability are directed by the Deep Submergence Systems Project (DSSP), one of 12 designated project offices under the Chief of Naval Material.

Submarine Rescue

The highest priority program within DSSP is the development of a system to rescue crewmen from a submarine disabled on the ocean floor above its collapse depth. The key element in this program is the Deep Submergence Rescue Vehicle (DSRV). These vehicles will be air transportable to provide rapid response to an undersea disaster anywhere in the world, capable of being transported "piggy-back" on submerged submarines for all-weather and under-ice operations, equipped with sophisticated sensors and propulsion equipment to locate and mate with disabled submarines, and capable of transferring up to 24 survivors per trip from the disabled submarine to the supporting "mother" submarine.

The DSRV–1 is now under construction by Lockheed Missiles and Space Co. in Sunnyvale, Calif. This 49.5 foot, 30-ton vehicle will be completed in late 1968.

Upon completion, the DSRV–1 will be transported to San Diego, Calif., for sea trials and rescue system tests on the San Clemente Island Range. These trials and tests will be conducted initially by Lockheed personnel and then by Navy personnel. During the DSRV–1's approximately 10 months at the range, the vehicle will be tested to its maximum operational depth and will mate with a simulated



Artist concept of the first of the deep submergence rescue vehicles (DSRV) planned by the Navy. The DSRV is shown mating to the restraining guide wires and the piggy back berth on the mother submarine.

disabled submarine hull on the ocean floor.

In conjunction with these tests, the diesel-electric submarine Salmon is being modified to simulate a "mother" submarine for the DSRV–1. The DSRV–1 will "land" aboard the Salmon's main deck aft of the sail structure, be locked down, and transported by the submarine. During this mating operation the DSRV–1's crew will be able to pass freely between the Salmon and the DSRV while they are locked together.

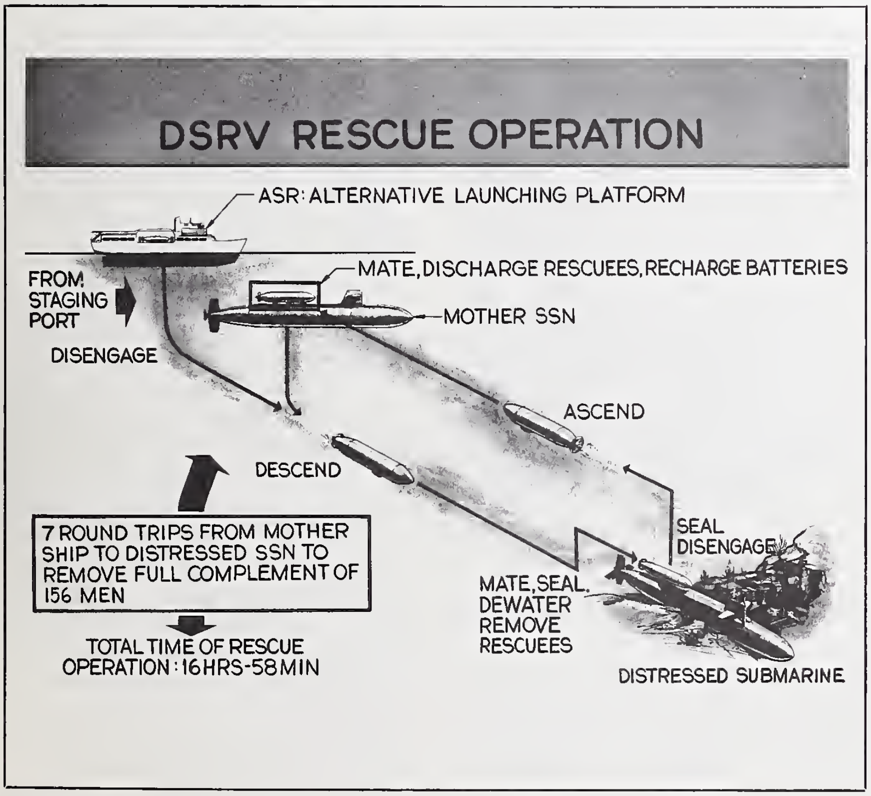
The requirements to mate underwater with a disabled submarine and with a moving submarine present the most difficult and challenging problems faced in the DSRV program. Design performance requirements specify that the DSRV must be capable of effecting a mate, in the presence of a one-knot current, to the deck of the disabled submarine at any angle up to 45 degrees from the horizontal. This mating requirement was the most important factor governing design of the DSRV.

The first step in the mating sequence involves pinpointing the exact location of the escape hatch of the stricken submarine. Although it is assumed that the disabled submarine location is known, the hatch itself may not be visible. The DSRV is equipped with several optical and sonar sensors, as well as several viewports, for this phase of the operation. If water visibility is good (50–100 feet or better), there should be little trouble in locating the hatch. If the water is "black," however, this step will be like groping in the dark, and sonic detection will be the only alternative.

The next two steps in the sequence —cutting the disabled submarine's buoy cable and "landing" on the hatch seat—require the DSRV to hover within a small area, in effect to operate as an underwater helicopter.

The DSRV propulsion and maneuvering system was designed to gain this capability. The DSRV's stern propeller and four ducted thrusters provide power in any of five degrees of freedom—pitch, yaw, surge, heave and sway. The sixth degree of freedom, that of roll, is controlled by a mercury trim-and-list system.

The flow field over the disabled submarine's hatch will probably not be uniform, even in a current of one knot. Hence, dynamic forces will be applied to the DSRV that may be difficult or impossible to counter. Should the DSRV not be able to hover in a disturbed field, it will have the aid of a hauldown winch and anchor system. In this situation, the DSRV need hover over the submarine only long enough to attach anchors and a hauldown grapnel hook to the submarine's hatch.


DSRV RESCUE OPERATION
ASR: ALTERNATIVE LAUNCHING PLATFORM
FROM STAGING PORT
MATE, DISCHARGE RESCUEES, RECHARGE BATTERIES
MOTHER SSN
DISENGAGE
ASCEND
DESCEND
7 ROUND TRIPS FROM MOTHER SHIP TO DISTRESSED SSN TO REMOVE FULL COMPLEMENT OF 156 MEN
TOTAL TIME OF RESCUE OPERATION: 16 HRS-58 MIN
SEAL DISENGAGE
MATE, SEAL, DEWATER REMOVE RESCUEES
DISTRESSED SUBMARINE

The next step in the mating sequence brings touchdown. To prevent excessive impact stresses or damage to the hatch seat, a hydraulic shock attenuation system has been provided. This system will permit impact velocities of up to two feet per second from any direction without damage to the DSRV. Upon touchdown, water will be forced out of the mating skirt to equalize internal pressures, if necessary, between the DSRV rescue spheres and the disabled submarine. The hatches can then be opened to transfer survivors.

The mating sequence for the DSRV is now being developed through the use of a Lighter-Than-Air Submarine Simulator (LASS). LASS uses a remote control airship resembling the DSRV. Because air and water are both fluids and vehicle movement is affected by the same dynamic forces, the airship can be used to simulate the vehicle.

The airship is approximately 50 feet long, weighs 170 pounds, and is neutrally buoyant. Propulsion is achieved by a conventional propeller aft encased in a movable ring stabilizer (similar to the DSRV main propulsion arrangement). The LASS "pilot" flies the airship by remote control, attempting to maneuver and mate the airship with a Quonset-hut structure which resembles a submarine hull and sail structure. Television cameras in the airship give the pilot a view of the "submarine," similar to that which the DSRV pilots will see during an actual mating operation with a disabled submarine.

The actual DSRV–1 vehicle is now being assembled at Sunnyvale, Calif. The vehicle's three pressure spheres will be mated with the fiberglass outer hull in April, with the entire vehicle to be fully assembled for sea trials in late 1968.

The contract for construction of the DSRV–2 was awarded to Lockheed Missiles and Space Co. in October 1967. This vehicle is scheduled for completion in mid-1969.

Search

The DSSP Search Program will provide the capability of locating and recovering small objects on the ocean floor to depths of 20,000 feet. The Deep Submergence Search Vehicle (DSSV) is being developed as a part of this program. This vehicle will be capable of operating at greater depths than any other undersea vehicle, except for the U.S. bathyscaph Trieste and the French bathyscaph Archimède. However, the bathyscaphs are essentially underwater elevators with relatively little endurance (five and 12 hours, respectively), limited horizontal maneuverability, and rudimentary search equipment.

In contrast, the new Navy search vehicle will have a bottom endurance of 30 hours at three knots with a 50-percent reserve power supply. Maximum speed will be five knots. The search vehicle will also have a great degree of maneuverability. An elaborate sensor system, similar to that of the rescue vehicle, will enable the DSSV to pinpoint small objects on the ocean floor. The search vehicle itself will be equipped to recover small objects and assist other recovery devices in lifting larger objects.

The key problem areas in the design of the search vehicle are those of power and materials. Because of the power/endurance requirements for search missions, the DSSV may be the first deep submergence vehicle to employ fuel cells as its primary power source. Based on current technology, a silver-zinc battery for the search vehicle would weigh from 21,000 to 25,000 pounds and require a volume of 200 to 230 cubic feet; the weight and space requirements for a comparable fuel cell power system are expected to be 9,000 to 11,000 pounds and 120 to 130 cubic feet. The Navy is issuing requests for proposal to five firms for the development of the DSSV fuel cell system (Allis Chalmers, Monsanto Research Corp., Union Carbide, Pratt and Whitney Aircraft, and General Electric). A contract to provide the system will be awarded to one of these firms in the fall of 1968.

The materials problems in the search vehicle program are essentially those of providing a vehicle which can withstand the tremendous pressure at 20,000 feet (almost 9,000 pounds per square inch) with a 50-percent safety factor and still have a reasonable amount of buoyancy. (The vehicle need not be positively buoyant when operating for its propulsion can be used to return it to the surface. In an emergency, the vehicle could jettison certain equipment to increase buoyancy.)

The simplest method of obtaining pressure protection is to increase the thickness of the pressure hull walls. However, this tends to increase the weight of the vehicle. The U.S. and French bathyscaphs, which can penetrate inner space, have huge buoyancy tanks filled with hexane (45,000 gallons in the Archimède) or aviation gas (47,000 gallons in the Trieste II) which provide the required buoyancy. But these "flotation tanks" make the bathyscaphs large, unwieldly, and restrict maneuverability.

Thus the Navy's new search vehicle will combine advanced materials for the pressure hull (titanium or high-yield steel) with high-buoyancy materials, such as syntactic foam, to provide a safe, yet highly maneuverable vehicle of reasonable size.

Like the rescue vehicle, the dimensions of the search vehicle are constrained by the requirement that it, too, like the rescue vehicle, be transported "piggy-back" aboard nuclear-powered "mother" submarines. However, air transportation will be a consideration and not a requirement.

Current planning calls for the following search vehicle characteristics: 70,000 pounds weight out of water, 50-foot length, 11-foot diameter, and a crew of two operators and two relief operators.

Lockheed Missiles and Space Co. and Westinghouse Electric Corp. are preparing parallel search vehicle design studies. One of these firms will be selected in mid-1968 to construct the vehicle with a contract go-ahead scheduled for fall of 1968. The DSSV-1 is scheduled to be completed in late 1971 and, after tests and trials, will be available for fleet use in 1972.

Long-range planning provides for the construction of four search vehicles. Two will be assigned to a search and recovery unit in the Atlantic and two to a similar unit in the Pacific. These units will each contain search vehicles, various sensor platforms, recovery devices, a "mother" submarine, and a surface support ship.

Man-in-the-Sea

The Navy's Man-in-the-Sea Program is providing the technology and equipment required for permitting divers to live and work on the ocean floor for extended periods of time. The technology being used to provide this capability is "saturation diving."

Employing current diving technology, divers operating from surface ships have an underwater endurance of about 30 minutes at 300 feet. However, in returning to the surface they require three hours of decompression, meaning a bottom time-to-decompression ratio of 1:6. Saturation diving seeks to reduce this unfavorable ratio. Briefly, the diver is provided with a seafloor habitat pressurized to the outside water pressure, and he is provided a suitable breathing gas. This enables him to live in the dry habitat and work in the surrounding water without passing through intermediate locks or requiring decompression until he returns to the surface, after weeks or months of useful work. At that time decompression becomes dependent on depth rather than duration of the dive. Thus, after a week or a month or even a year, at a depth of 400 feet, the saturated diver will require a standard decompression of about three days.

The U.S Navy open-sea experiments in saturation diving are known as SEALABs (Sea Laboratories), and the divers taking part in these operations are designated aquanauts.

The forthcoming SEALAB III experiment will be man's most ambitious effort to live and work on the ocean floor. During SEALAB III Navy men and civilian scientists will live in a seafloor habitat and work in the surrounding water for 60 days, carrying out tasks in the area of oceanography research, underwater construction, salvage, biological studies, and human performance and equipment evaluations.

This work operation will greatly advance man's capability to explore and exploit the ocean floor. SEALAB III—the Navy's open-sea experiment in saturation diving—will have five teams of eight men, each living in a 57-foot by 12-foot undersea laboratory for 12-day periods. Their habitat will be placed at a depth of 450 feet, off San Clemente Island, for the first three teams. Depending upon data from early phases of the experiment, the third team may move the habitat to a depth of 600 feet for use by the last two teams.

The habitat itself is being refurbished at the San Francisco Bay Naval Shipyard (where it was built for use in SEALAB II, a 45-day, 205-foot experiment conducted in 1965).

Other key hardware components of SEALAB III include the surface support ship, which was converted for range undersea support operations at the Avondale Shipyards and is being outfitted at the San Francisco Bay Naval Shipyard; the diver support equipment, which is being developed and fabricated by a number of Navy activities and commercial firms; and the aquanauts themselves, who are being trained at the Deep Submergency Systems Project Technical Office in San Diego, the Navy Underwater Swimmers School, Key West, Fla., and the Navy Experimental Diving Unit, Washington, D.C.

SEALAB III is now scheduled to begin in the late summer or early fall of 1968.

Large Object Salvage System

Much of the technology and equipment being developed in the Navy's Man-in-the-Sea Program will be employed in the Large Object Salvage System (LOSS). This program will provide the Navy with the capability of lifting a sunken submarine from a depth of 850 feet (the approximate depth limit of the continental shelf, the gently sloping off-shore extension of land masses).

In LOSS, pontoons and lift-control barges will be employed to lift a submarine or other large object to the surface. Divers will be required to perform a number of tasks in a deep-sea salvage operation, among them such key jobs as attaching the lifting cables to the hulk.

The other major component of LOSS is the salvage operational control ship which will contain computer and display equipment to aid the salvage master in problem areas, such as general communications, initial mooring design, calculating the breakout force necessary to free the submarine from bottom suction, buoyancy predictions, lift distribution, etc. Oceanographic and meteorological sensor and evaluation equipment, vital to salvage operations, will also be included in the ship.

The overall LOSS program has been delayed because of budgetary cuts. The SEALAB III experiment, which will begin later this year, will test out the diving system and related work equipment, such as diver tools which will become part of an operational salvage system. The Naval Civil Engineering Laboratory at Port Hueneme, Calif., is conducting studies into breakout force requirements for different ocean-floor areas; the Naval Undersea Warfare Center at Pasadena, Calif., is studying a wreck coordinate system which will assist a diver in navigating between his seafloor habitat and work area; and the Naval Ordnance Laboratory at White Oak, Md., is working on a padeye attachment which can be used in lifting hulks from the ocean floor.

Although lack of funding makes LOSS scheduling uncertain, it is expected that two LOSS units will be operational by the mid-1970s.

NR–1

Included in the DSSP program is a nuclear propelled deep submergence research vehicle, the NR–1. Security classification precludes any discussion on this project in this article.

Capt. Wiliam M. Nicholson, USN, has been Project Manager of the Navy's Deep Submergence Systems Project since Jan. 1967. Prior to this assignment, he served as Head of the Ship Systems Engineering Department, Naval Ship Engineering Center, and before that held various assignments in naval engineering, ship design and engineering management.

The various programs of the Navy's Deep Submergence Systems Project will provide the nation with an invaluable capability to exploit the ocean depths for military and economic operations. The spin-off from the programs are already being felt in non-military areas. Saturation diving, a concept developed by the U.S. Navy and proven in laboratory tests, has been widely adopted for use in underwater oil drilling and similar activities. There is today a definite requirement for saturation diving in Southeast Asia.

President Johnson has observed: "Much of our natural bounty consists of water . . . the oceans of the world hold great promise to provide future generations with minerals, food, energy, and fresh water. We must turn our attention to finding more appropriate ways and better means of transforming this promise into achievement."

The Navy's Deep Submergence Systems Project is today helping to turn this promise into achievement—in our time.

Army Forms Engineer Division To Handle Sentinel Construction

The Army has organized a new Engineer Division at Huntsville, Ala., to direct the design and construction of the Sentinal anti-ballistic missile system.

The new division is temporarily headquartered in Alexandria, Va., but is destined to be permanently located at Huntsville, adjacent to the Sentinel System Command at Redstone Arsenal which is responsible for development of the ABM system.

Brigadier General Robert P. Young, former head of the Army Engineer Command, Europe, is the new division engineer. Colonel George A. Rebh, Tulsa District Engineer, has been named Deputy Division Engineer.

As construction proceeds, an area engineer will be appointed at each Sentinel site to manage construction.

Security Classification Guidance for Defense Industry

George MacClain

Comprehensive, accurate and understandable security classification guidance for defense contractors and subcontractors, who work with classified information, is indispensable if the Industrial Security Program of the Defense Department is to be used and administered in an effective and economical manner.

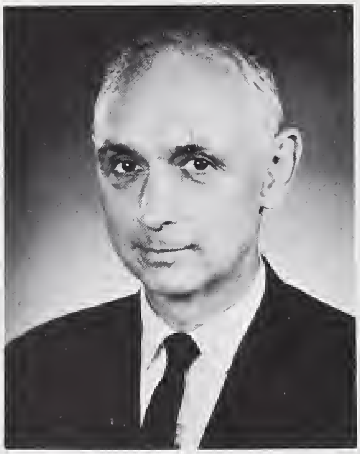
The familiar instrument for providing security classification guidance to industry is the DD Form 254. This instrument has been in use for many years and is revised from time to time. The last major revision occurred in 1960, at which time the principal objective was to emphasize the importance of classifying information, rather than classifying the document, hardware, or other material in which the information was contained. That concept applies today, not only with respect to the DD Form 254 but with respect to all security classification and security classification guidance.

Despite the 1960 improvement, a number of adverse criticisms to the DD Form 254 were made. The chief complaints were that the DD Form 254 did not sufficiently provide specific classification guidance, and that the check list items were too broad and not sufficiently inclusive to be equally well suited to the many kinds of classified contractual work. There were also other complaints relating, for example, to the procedures for issuance and to the maintenance of current accuracy in the guidance provided.

Beginning in 1965, a determined effort was instituted in the Directorate for Classification Management,[1] Office of the Assistant Secretary of Defense (Administration), to identify the serious problems and to discover ways and means to bring about needed and desirable improvements, not only in the DD Form 254 but also in the associated policies and procedures. In this connection, the views of industry were solicited and many very helpful views were received.

Additionally, proposals were put together within DOD, and were considered and commented upon by the various DOD components whose operations include procurement activities in industry.

In August 1967, the Assistant Secretary of Defense (Administration) approved a new and improved plan for providing security classification guidance to industry. Briefly, this plan encompasses continued use of the DD Form 254, but the form has been redesignated "Contract Security Classification Specification," and has been revised in both content and form. The policies and procedures for the preparation and use of this form have been revised. A new DD Form 254c has been established to serve as a continuation sheet for the DD Form 254.



George MacClain is the Dir., Security Classification Management Div., Directorate for Security Policy, in the Office of the Asst. Secretary of Defense (Administration). He has held this position since 1963. From March 1955 until March 1963, he served as Legal Advisor and Special Asst. to the Dir., Office of Industrial Personnel Access Authorization (Security Review), in the Office of the Asst. Secretary of Defense (Manpower).

The whole plan will become effective, so far as industry is concerned, upon the completion of the revision of those parts of the DOD Industrial Security Regulation (DOD 5220.22–R) and the DOD Industrial Security Manual (DOD 5220.22–M) which must be revised in order to implement this new plan. This revision is expected to be published early in 1968.

The total plan, as approved by the Assistant Secretary of Defense (Administration), has been disseminated within DOD and to those agencies of the Government outside of DOD which, pursuant to mutual agreement, use the DOD Industrial Security Program. Because of this advanced dissemination, the User Agencies, both within and outside of DOD, will be ready to go into operation under the new plan promptly upon its issuance for use by industry.

During the period in which the new plan has been developed, frequent opportunities have been utilized to emphasize to the members of the defense industrial community, who will be involved, that it is hoped and intended that the new plan will motivate and facilitate the desired environment of mutual cooperation, mutual helpfulness, and mutual understanding among the User Agencies, the Office of Industrial Security of the Defense Contract Administration Services, and defense contractors and subcontractors. In this connection, it is desirable to quote a few passages from the newly adopted policies and procedures. These quotations follow:

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[1] *Now designated Security Classification Management Division, Directorate for Security Policy.*

> **"Security classification guidance for contractors in industry is continuously and at all times the responsibility of Program/Project/Systems Managers, or equivalent officials. . . . their respective successors in interest, and their respective higher level supervisors and commanders in the same channel or chain of command."**
>
> **"The completed contract security classification specification (DD Form 254), including DD Form 254c, attachments and supplements, is the basic document for conveying to the contractor classification, regrading and declassification specifications for a classified contract or subcontract. *It is designed to indicate, by a combination of a 'check list' and narrative comment, the classified areas of information involved in the contract or subcontract and, particularly, to identify the specific items of information within those areas which require security classification protection.*" (Italics added)**
>
> **"In order to increase the effectiveness of guidance furnished and provide advance notice of pending possible classification requirements, . . . responsible officials [within the User Agency] should endeavor, by arrangements which are reasonable and fair to all concerned, to offer to contractors and potential contractors which have the necessary facility clearances, opportunity to participate in the preparation of the security classification specification."**

The revised DD Form 254, and the new DD Form 254c are shown in the illustrations on pages 29 and 30.

From these illustrations, it will be seen that the DD Form 254 and the DD Form 254c each consist of a single sheet, front and back. A comparison of Item 13 of the 254 with 254c shows the interrelationship between the two forms. Item 13 of the 254 must be completed in every case. In some cases, the necessary check list and narrative security classification comment can be provided in the space available in Item 13. If not, the 254c or, as explained below, an authorized substitute for the 254c must be cross referenced in Item 13 and, when completed, must be attached to the 254. Item 13 of the 254 also permits the listing of other documents as attachments to the 254, in the event that such other documents are needed to provide complete security classification guidance.

It is important to note that, although the 254c is available and may be used, the User Agency may substitute a different document of its own authorship in lieu of the 254c. Any such substitute document, however, will not be authorized for use unless, within its own form and content, it provides all of the classification guidance that must be provided by the 254c. Thus Item 13 of the 254, the 254c, and any substitute for the 254c, collectively, must always provide both a check list or index of items, and an appropriate narrative statement of classification guidance covering each applicable item listed.

When the new plan is made effective within industry, the existing 254, the "closeout 254," and the "Letter in Lieu of" will be discontinued. The "revised" and "final" 254 will be continued, but the policies and procedures for their use have been changed through clarification and simplifications which will be covered later in this article.

Special attention is invited to Items 2, 3, 6a, 7a, and 8 on the front side of the 254 illustrated. The proper use of these items will, in every instance, accurately identify the precise purpose and addressee of the particular 254—the prime contractor, the first tier subcontractor, and the relationship to one another of the successive tiers of subcontractors, after the first tier down to and including the tier for which the particular 254 is being issued. In every case, even where the 254 is being issued to a subcontractor of the first or any other tier, the prime contract and contractor will be identified in Items 3a and 6a. In every case of a 254 issued for a subcontractor, regardless of tier, the first tier subcontract and subcontractor will be identified in Items 3b and 7a. The identity of subcontracts and subcontractors after the first tier will be shown in Item 8. For example, if the particular 254 is to be issued to a fourth tier subcontractor, Item 8 will include a listing in the proper order of succession, beginning with the second tier, of the second, third and fourth tier subcontracts and subcontractors.

It is important to note how the 254 will relate to Invitations for Bid, Requests for Proposal, Requests for Quote, or any other form of solicitation of proposal. Items 2c, 3a, 3b, 3c, 6a, 7a, and 8 are involved in this connection. For example, if the 254 is being issued to accompany an Invitation for Bid (IFB) for a proposed prime contract, Item 2c will be checked; Item 3c will contain an identifying description of the IFB; and Item 6a will contain the name and address of the potential prime contractor's facility to which the 254 is to be sent. If the 254 is being issued to accompany an IFB for a proposed first tier subcontract, Item 2c will be checked; Items 3c and 6a will identify the prime contract and contractor; Item 3c will contain an identifying description of the IFB; and Item 7a will contain the name and address of the potential first tier subcontractor's facility to which the 254 is to be sent.

Earlier herein it was stated that the policies and procedures for issuance of the 254 have been revised and that the "closeout" 254 and "Letter in Lieu of" will be discontinued. An original 254 will be issued with each Request for Proposal (RFP), Request for Quote (RFQ), Invitation for Bid (IFB), or other solicitation, and with an award of a contract or follow-on contract. A new 254 is not required for a follow-on contract when the procurement is of a recurring nature, or when the end item is not changed and there is no change from the security classification requirements applicable to the preceding contract. However, a copy of the currently valid 254 for the preceding contract will be furnished and distributed with the follow-on contract, and will be annotated to show the contract number of the follow-on contract.

A final 254 will be issued upon final delivery of goods or services or upon termination of contract but only if at that time:

- Authority is granted to retain classified material over which the User Agency has classification jurisdiction and responsibility, *i.e.*, classified material originated by the User Agency or generated by the contractor in the performance of the contract.
- All classified material, for which retention authority otherwise would be required, is ordered immediately declassified.

A revised 254 will be issued when, at any time subsequent to the issuance of the original 254, additional guidance in connection therewith is required to be disseminated, or, at the time of any review of an outstanding original or final 254, the then outstanding guidance is changed.

The new plan spells out certain typical situations and sets forth specific policies and procedures for each. For example, a 254 will not be required when classified procurement is limited to graphic art reproduction and the classification markings appear on the finished material which is to be reproduced. As another example, a guard service contract or alternate storage service contract will require a 254 to describe, in Item 13, the highest level or various levels of classification of information with respect to which the service must be performed, even though no additional breakdown of contract elements by classification is needed. It is believed that, in these and the other typical situations which are covered, the policies and procedures to be followed will simplify and reduce the burden of the 254.

A very important distinction has been introduced in the new plan. This distinction recognizes that the classified documentary material in the custody of the contractor can be separated into two distinct categories. One category is called "reference material." Reference material is defined as that classified documentary material over which the User Agency does not have classification jurisdiction, and did not have classification jurisdiction at the time such material was originated. Much material made available to contractors by the Defense Documentation Center (DDC) and other secondary distribution agencies is reference material as defined herein. The other category, of course, is all other classified documentary material furnished to the contractor or generated by the contractor in the course of contract performance.

Recognition of the separate status of reference material, previously described, leads to significant results. First and foremost, the User Agency will not be regarded as having any classification guidance jurisdiction or responsibility with respect to such material. Secondly, in the case of a contract the performance of which is expected to require access only to reference material, an original 254 will be issued but only for limited purposes. First it will be issued to describe, in Item 13, the highest level or various levels of classification of reference material, to which access is expected to be required; second, to provide, in Item 13, any other security instructions which may be appropriate, such as the protection of classified information extracted from such material. Thirdly, a final 254 will not be issued in connection with granting retention authority, if all of the classified material authorized to be retained is reference material. Fourthly, the User Agency will not be required to review a 254, when the contract involved is classified solely because the contractor is permitted to have access to reference material.

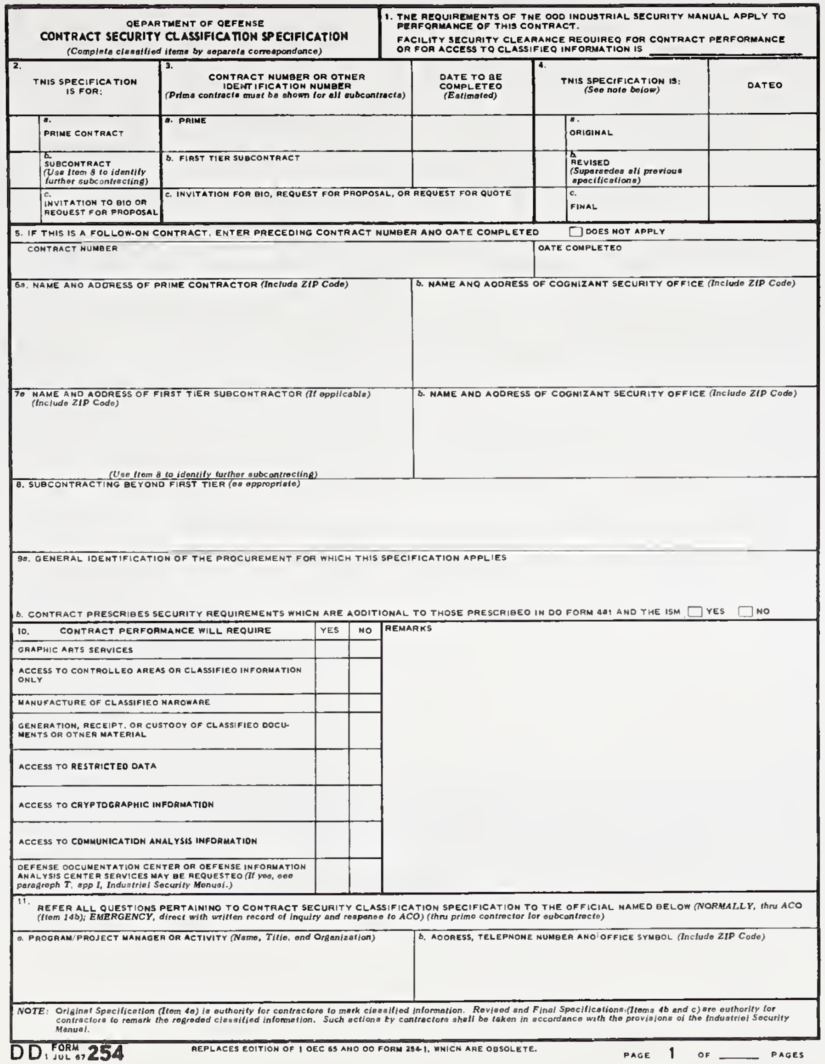
It is essential, of course, that the security classification guidance provided by a 254 be kept current. To this end, the User Agency must systematically review and, as necessary, revise the 254. Under the new plan, as just indicated, this review requirement will not apply with respect to reference material. With respect to all other classified material, however, the review requirement will apply. Thus, during contract performance, review will be required at each change of phase or more frequently if directed to be done, and in any event at least once annually. Also, review will be required at the time of final delivery of goods or services, or upon termination of the contract if at that time a final 254 is required to be issued. As stated earlier herein, a final 254 will be required only if authority is granted to retain classified material over which the User Agency has classification jurisdiction and responsibility, or all of that material is ordered immediately declassified. A final 254 is not required when the authority to retain is confined exclusively to reference material. Lastly, when a final 254 has been issued in connection with granting retention authority, that 254 itself must be reviewed at the conclusion of the retention period if at that time an extension of the retention authority is granted, or if at that time all material for which retention authority would be required is ordered immediately declassified.

As indicated, the User Agency has no classification guidance responsibility for reference material. However, a procedure is provided to enable a contractor to obtain current classification guidance with respect to such material. Consonant with basic classification management policy, classification guidance responsibility for reference material continuously remains with the DOD component which had classification jurisdiction over the material at the time it was prepared, or with the current successor in interest to that component. If a contractor desires classification guidance for reference material and cannot identify the responsible component, he is entitled to seek assistance in making such identification by submitting direct inquiry, in successive order, to the secondary distribution source from which the material was received, the User Agency contracting office last involved with the contractor concerning the subject matter of the material, and the Security Classification Management Division, Directorate for Security Policy, Office of the Assistant Secretary of Defense (Administration). In addition, of course, the contractor always has available to him the guidance, the authority and the procedures of the automatic, time-phased downgrading and declassification system.

The User Agency, in addition to being responsible for systematic review of classification guidance for classified material within its classification jurisdiction, also is responsible for "need-to-know" review in relation to acting upon a contractor's request for authority to retain classified material. This particular need-to-

DD Form 254
Contract Security Classification Specification

Front



DEPARTMENT OF DEFENSE
CONTRACT SECURITY CLASSIFICATION SPECIFICATION
(Complete classified items by separate correspondence)

1. THE REQUIREMENTS OF THE DOD INDUSTRIAL SECURITY MANUAL APPLY TO PERFORMANCE OF THIS CONTRACT.
FACILITY SECURITY CLEARANCE REQUIRED FOR CONTRACT PERFORMANCE OR FOR ACCESS TO CLASSIFIED INFORMATION IS ________

2. THIS SPECIFICATION IS FOR:	3. CONTRACT NUMBER OR OTHER IDENTIFICATION NUMBER *(Prime contracts must be shown for all subcontracts)*	DATE TO BE COMPLETED *(Estimated)*	4. THIS SPECIFICATION IS: *(See note below)*	DATED
☐ a. PRIME CONTRACT	a. PRIME		☐ a. ORIGINAL	
☐ b. SUBCONTRACT *(Use Item 8 to identify further subcontracting)*	b. FIRST TIER SUBCONTRACT		☐ b. REVISED *(Supersedes all previous specifications)*	
☐ c. INVITATION TO BID OR REQUEST FOR PROPOSAL	c. INVITATION FOR BID, REQUEST FOR PROPOSAL, OR REQUEST FOR QUOTE		☐ c. FINAL	

5. IF THIS IS A FOLLOW-ON CONTRACT, ENTER PRECEDING CONTRACT NUMBER AND DATE COMPLETED ☐ DOES NOT APPLY
CONTRACT NUMBER
DATE COMPLETED

6a. NAME AND ADDRESS OF PRIME CONTRACTOR *(Include ZIP Code)*
b. NAME AND ADDRESS OF COGNIZANT SECURITY OFFICE *(Include ZIP Code)*

7a. NAME AND ADDRESS OF FIRST TIER SUBCONTRACTOR *(If applicable)* *(Include ZIP Code)*
(Use Item 8 to identify further subcontracting)
b. NAME AND ADDRESS OF COGNIZANT SECURITY OFFICE *(Include ZIP Code)*

8. SUBCONTRACTING BEYOND FIRST TIER *(as appropriate)*

9a. GENERAL IDENTIFICATION OF THE PROCUREMENT FOR WHICH THIS SPECIFICATION APPLIES

b. CONTRACT PRESCRIBES SECURITY REQUIREMENTS WHICH ARE ADDITIONAL TO THOSE PRESCRIBED IN DD FORM 441 AND THE ISM ☐ YES ☐ NO

10. CONTRACT PERFORMANCE WILL REQUIRE	YES	NO	REMARKS
GRAPHIC ARTS SERVICES			
ACCESS TO CONTROLLED AREAS OR CLASSIFIED INFORMATION ONLY			
MANUFACTURE OF CLASSIFIED HARDWARE			
GENERATION, RECEIPT, OR CUSTODY OF CLASSIFIED DOCUMENTS OR OTHER MATERIAL			
ACCESS TO RESTRICTED DATA			
ACCESS TO CRYPTOGRAPHIC INFORMATION			
ACCESS TO COMMUNICATION ANALYSIS INFORMATION			
DEFENSE DOCUMENTATION CENTER OR DEFENSE INFORMATION ANALYSIS CENTER SERVICES MAY BE REQUESTED *(If yes, see paragraph T, app I, Industrial Security Manual.)*			

11. REFER ALL QUESTIONS PERTAINING TO CONTRACT SECURITY CLASSIFICATION SPECIFICATION TO THE OFFICIAL NAMED BELOW *(NORMALLY, thru ACO (Item 14b); EMERGENCY, direct with written record of inquiry and response to ACO) (thru prime contractor for subcontracts)*
a. PROGRAM/PROJECT MANAGER OR ACTIVITY *(Name, Title, and Organization)*
b. ADDRESS, TELEPHONE NUMBER AND OFFICE SYMBOL *(Include ZIP Code)*

NOTE: Original Specification (Item 4a) is authority for contractors to mark classified information. Revised and Final Specifications (Items 4b and c) are authority for contractors to remark the regraded classified information. Such actions by contractors shall be taken in accordance with the provisions of the Industrial Security Manual.

DD FORM 1 JUL 67 254 REPLACES EDITION OF 1 DEC 65 AND DD FORM 254-1, WHICH ARE OBSOLETE. PAGE 1 OF ____ PAGES

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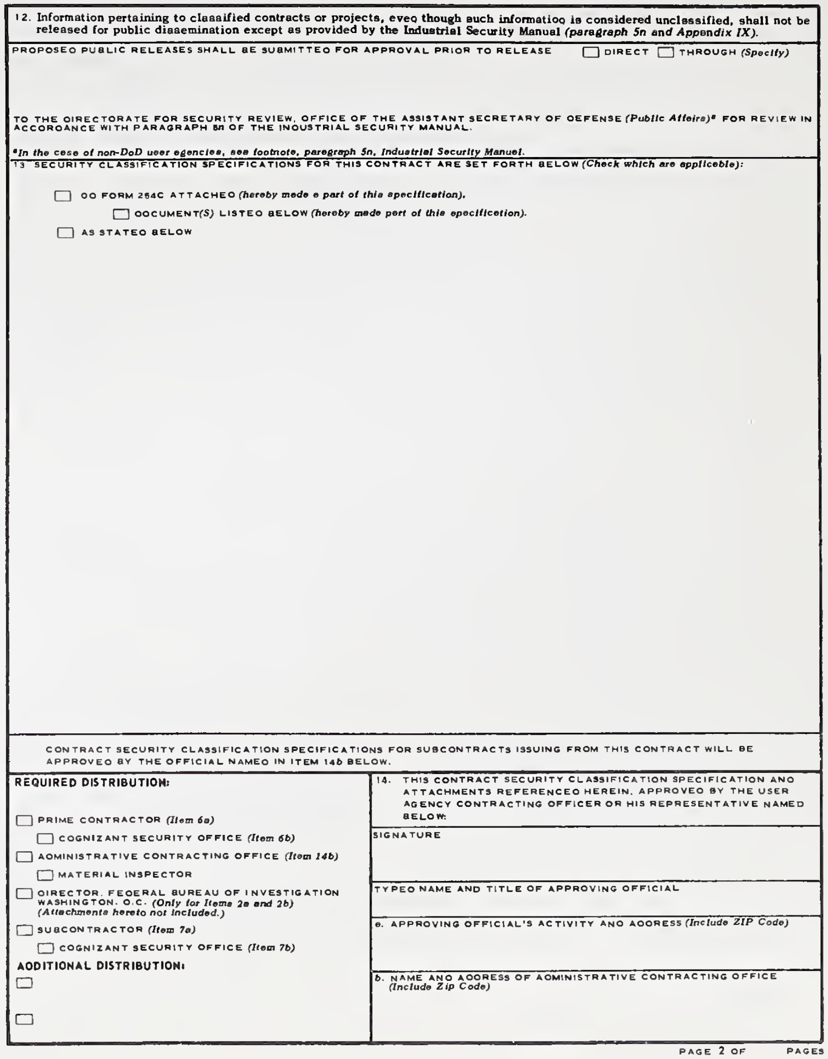

12. Information pertaining to classified contracts or projects, even though such information is considered unclassified, shall not be released for public dissemination except as provided by the Industrial Security Manual *(paragraph 5n and Appendix IX)*.

PROPOSED PUBLIC RELEASES SHALL BE SUBMITTED FOR APPROVAL PRIOR TO RELEASE ☐ DIRECT ☐ THROUGH *(Specify)*

TO THE DIRECTORATE FOR SECURITY REVIEW, OFFICE OF THE ASSISTANT SECRETARY OF DEFENSE *(Public Affairs)** FOR REVIEW IN ACCORDANCE WITH PARAGRAPH 5n OF THE INDUSTRIAL SECURITY MANUAL.

**In the case of non-DoD user agencies, see footnote, paragraph 5n, Industrial Security Manual.*

13. SECURITY CLASSIFICATION SPECIFICATIONS FOR THIS CONTRACT ARE SET FORTH BELOW *(Check which are applicable)*:

- ☐ DD FORM 254C ATTACHED *(hereby made a part of this specification)*.
  - ☐ DOCUMENT(S) LISTED BELOW *(hereby made part of this specification)*.
- ☐ AS STATED BELOW

CONTRACT SECURITY CLASSIFICATION SPECIFICATIONS FOR SUBCONTRACTS ISSUING FROM THIS CONTRACT WILL BE APPROVED BY THE OFFICIAL NAMED IN ITEM 14b BELOW.

REQUIRED DISTRIBUTION:

- ☐ PRIME CONTRACTOR *(Item 6a)*
  - ☐ COGNIZANT SECURITY OFFICE *(Item 6b)*
- ☐ ADMINISTRATIVE CONTRACTING OFFICE *(Item 14b)*
  - ☐ MATERIAL INSPECTOR
- ☐ DIRECTOR, FEDERAL BUREAU OF INVESTIGATION WASHINGTON, D.C. *(Only for Items 2a and 2b) (Attachments hereto not included.)*
- ☐ SUBCONTRACTOR *(Item 7a)*
  - ☐ COGNIZANT SECURITY OFFICE *(Item 7b)*

ADDITIONAL DISTRIBUTION:

- ☐
- ☐

14. THIS CONTRACT SECURITY CLASSIFICATION SPECIFICATION AND ATTACHMENTS REFERENCED HEREIN, APPROVED BY THE USER AGENCY CONTRACTING OFFICER OR HIS REPRESENTATIVE NAMED BELOW:

SIGNATURE

TYPED NAME AND TITLE OF APPROVING OFFICIAL

a. APPROVING OFFICIAL'S ACTIVITY AND ADDRESS *(Include ZIP Code)*

b. NAME AND ADDRESS OF ADMINISTRATIVE CONTRACTING OFFICE *(Include Zip Code)*

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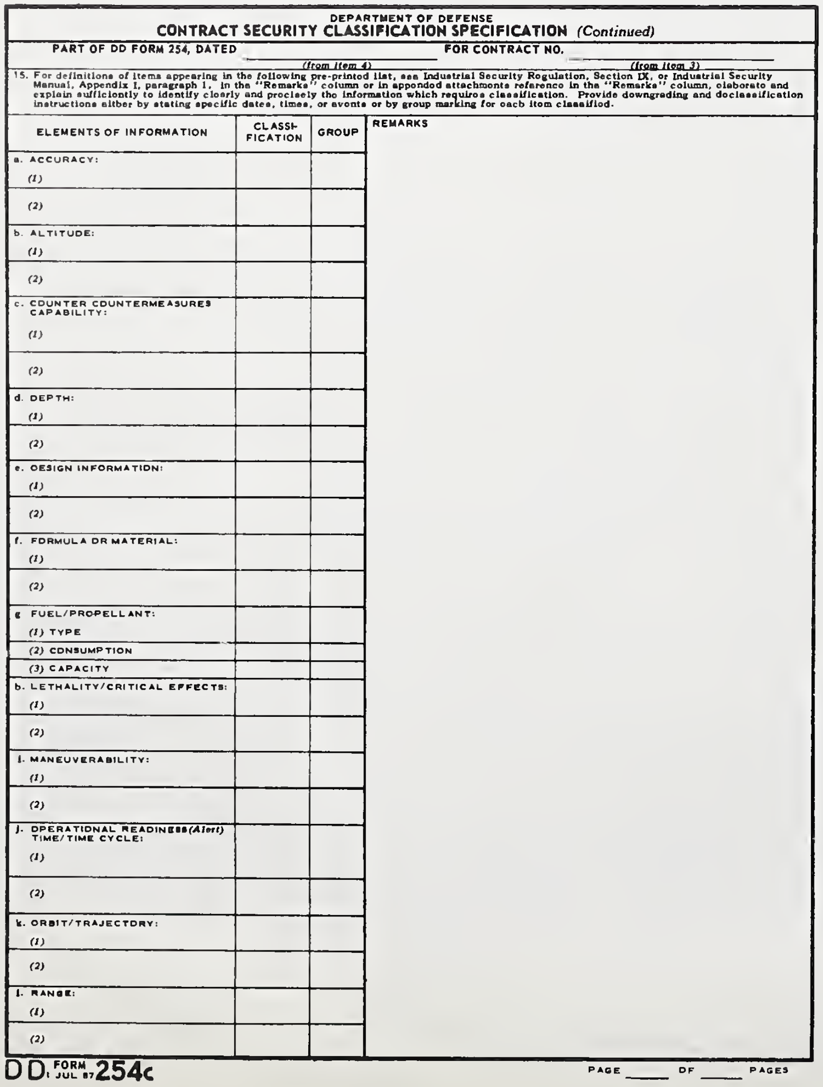
DD Form 254c
Contract Security Classification Specification (continued)

Front



DEPARTMENT OF DEFENSE
CONTRACT SECURITY CLASSIFICATION SPECIFICATION *(Continued)*

PART OF DD FORM 254, DATED ______ *(from item 4)* FOR CONTRACT NO. ______ *(from item 3)*

15. For definitions of items appearing in the following pre-printed list, see Industrial Security Regulation, Section IX, or Industrial Security Manual, Appendix I, paragraph 1. In the "Remarks" column or in appended attachments reference in the "Remarks" column, elaborate and explain sufficiently to identify clearly and precisely the information which requires classification. Provide downgrading and declassification instructions either by stating specific dates, times, or events or by group marking for each item classified.

ELEMENTS OF INFORMATION	CLASSIFICATION	GROUP	REMARKS
a. ACCURACY: *(1)*			
(2)			
b. ALTITUDE: *(1)*			
(2)			
c. COUNTER COUNTERMEASURES CAPABILITY: *(1)*			
(2)			
d. DEPTH: *(1)*			
(2)			
e. DESIGN INFORMATION: *(1)*			
(2)			
f. FORMULA OR MATERIAL: *(1)*			
(2)			
g. FUEL/PROPELLANT: *(1)* TYPE			
(2) CONSUMPTION			
(3) CAPACITY			
h. LETHALITY/CRITICAL EFFECTS: *(1)*			
(2)			
i. MANEUVERABILITY: *(1)*			
(2)			
j. OPERATIONAL READINESS *(Alert)* TIME/TIME CYCLE: *(1)*			
(2)			
k. ORBIT/TRAJECTORY: *(1)*			
(2)			
l. RANGE: *(1)*			
(2)			

DD FORM 1 JUL 67 254c PAGE ____ OF ____ PAGES

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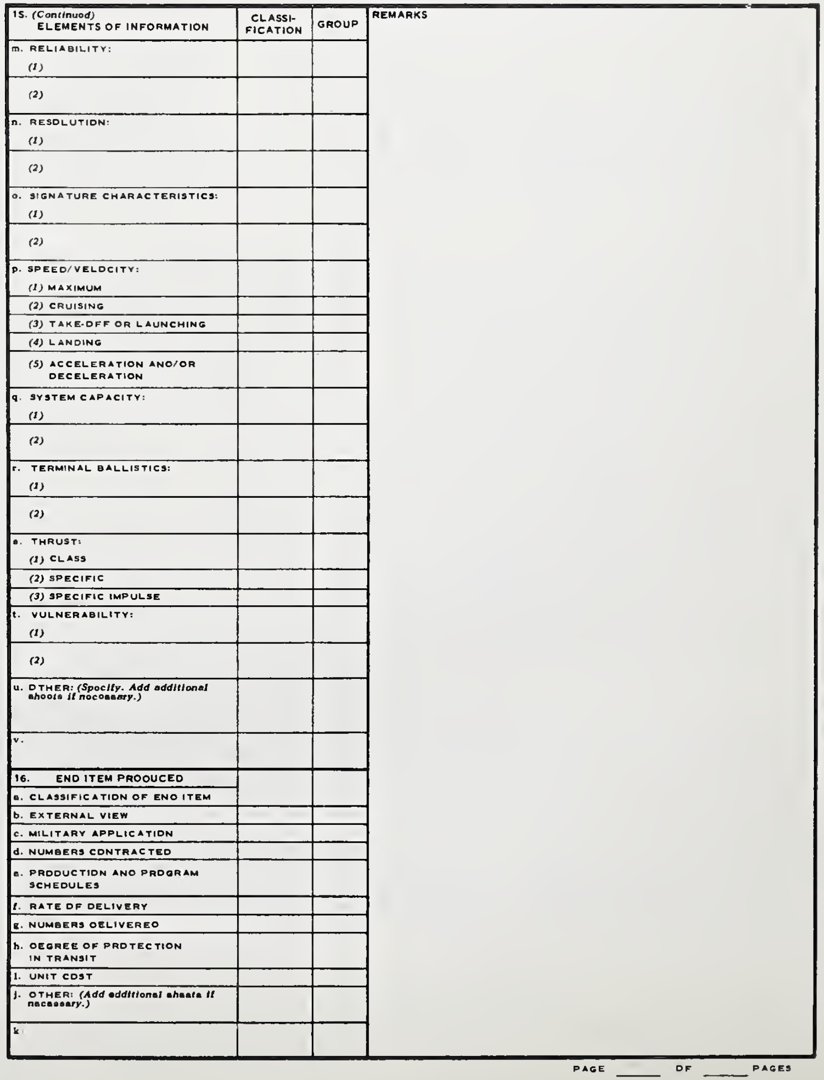

15. *(Continued)* ELEMENTS OF INFORMATION	CLASSIFICATION	GROUP	REMARKS
m. RELIABILITY: *(1)*			
(2)			
n. RESOLUTION: *(1)*			
(2)			
o. SIGNATURE CHARACTERISTICS: *(1)*			
(2)			
p. SPEED/VELOCITY: *(1)* MAXIMUM			
(2) CRUISING			
(3) TAKE-OFF OR LAUNCHING			
(4) LANDING			
(5) ACCELERATION AND/OR DECELERATION			
q. SYSTEM CAPACITY: *(1)*			
(2)			
r. TERMINAL BALLISTICS: *(1)*			
(2)			
s. THRUST: *(1)* CLASS			
(2) SPECIFIC			
(3) SPECIFIC IMPULSE			
t. VULNERABILITY: *(1)*			
(2)			
u. OTHER: *(Specify. Add additional sheets if necessary.)*			
v.			
16. END ITEM PRODUCED			
a. CLASSIFICATION OF END ITEM			
b. EXTERNAL VIEW			
c. MILITARY APPLICATION			
d. NUMBERS CONTRACTED			
e. PRODUCTION AND PROGRAM SCHEDULES			
f. RATE OF DELIVERY			
g. NUMBERS DELIVERED			
h. DEGREE OF PROTECTION IN TRANSIT			
i. UNIT COST			
j. OTHER: *(Add additional sheets if necessary.)*			
k.			

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know requirement arises at the time of final delivery of goods or services, or upon termination of contract, and also at the conclusion of any previously authorized period of retention. From the standpoint of this particular need-to-know review requirement, there is no difference at all between reference material and all other classified material. For each, the contractor must satisfy the User Agency of his need-to-know. If, however, need-to-know is established for classified material under the classification jurisdiction of the User Agency, then, with respect to the material, the User Agency must also accomplish a security classification review, and prepare a final 254 containing the resulting guidance. With respect to any reference material for which the contractor establishes need-to-know, the authority to retain will not be granted by a final 254 but, instead, will be made known to the contractor by separate documentation. Any grant of retention authority is for a specific period of time, and the same obligations and procedures recur at the end of any such period, if at that time the contractor requests an extension of retention authority.

A fundamental policy carried over into the new plan is that the User Agency is responsible for classification guidance for a classified contract. Within a User Agency, the responsibility attaches specifically to the appropriate program/project/system manager, or equivalent official. Responsibility for the preparation of the guidance, contained in the 254 for a prime contract, attaches exclusively to those officials. Some of the administrative mechanics and the authentication of the 254 by signature, however, are accomplished in all cases by the User Agency procuring contracting officer (PCO) or his authorized representative. Traditionally, reference has been made to the PCO as the source of the content of the 254, but this must be understood to have been and to be a shorthand term descriptive of the fact that the PCO is merely acting as the authenticating agent for the program/project/system manager or other equivalent official concerned.

At this point, it is essential to refer to the administrative contracting officer (ACO). Sometimes the ACO function is retained by the User Agency and is not delegated to the Defense Contract Administration Services (DCAS) of the Defense Supply Agency. In other cases, this ACO function is delegated. For the sake of clarity, reference hereafter will be made to PCO or ACO as intended, and no distinction will be made between cases where the ACO function is delegated or not delegated.

The ACO enters into the picture of a classified contract, of course, after the contract has been entered into. He has no responsibility for preparation or distribution of the 254 addressed to the prime contractor. It is the ACO's responsibility, however, to surface and bring about resolution by the User Agency of cases in which the 254, as prepared for and distributed to the prime contractor, is found to be inadequate for any reason.

The ACO's function is different with respect to a 254 prepared for a subcontractor. In this situation, the responsibility for preparation of the 254 is placed upon the prime contractor. He will use his own 254 as the basis for the guidance to be stated in the subcontract 254. The ACO, in this situation, must review the proposed subcontract 254. If he finds it adequate and satisfactory, he then becomes the authenticating official charged with signing it and assuring distribution. If problems develop, the ACO has no power to force a resolution in favor of any party. Instead, the ACO is charged with referring the matter to the PCO for consideration and resolution by the program/project/system manager or equivalent official of the User Agency. The relationship of a first tier subcontractor to a second tier subcontractor is essentially similar to that of a prime contractor to a first tier subcontractor, and will not be discussed herein in detail.

During the performance period of a contract, the cognizant security office, assisted by the ACO, is the means by which the security classification guidance furnished for the contract or subcontract is made to work smoothly. The cognizant security office serves as a catalyst to bring about necessary communication and understanding between the contractor or subcontractor, and those User Agency officials whose ultimate responsibility it is to prepare and interpret the guidance which is set forth in the 254. In no case is it intended that the cognizant security office or the ACO will exercise the power to settle a controversy as to the meaning or sufficiency of particular classification guidance. Of course, common sense, tact, and good judgment will be used to assist the contractor or subcontractor in overcoming his particular difficulty of understanding.

Obviously, the effectiveness of the new plan depends upon a continuing spirit of full cooperation by all parties concerned, and a willingness to take a reasonable and objective view toward making the 254 do its intended job. In this environment, it is inappropriate, and not at all the desire of DOD, that the contractor or subcontractor should feel embarrassed to bring questions of lack of understanding or satisfaction to the attention of the appropriate government officials in the User Agency concerned. In this connection, it is particularly important to know that, for the purpose of interpretation, a particular procedure is provided. This procedure is described very briefly in Item 11 of the 254. Under this procedure, the User Agency may communicate directly with the contractor or subcontractor with appropriate notification to the ACO, although normally such communication would be better made by routing it through the ACO. In the reverse direction, if a contractor or subcontractor desires clarification or to offer suggestion with respect to security classification guidance, he ordinarily must address his inquiry to the User Agency through the ACO. However, if there is a real emergency, the contractor or subcontractor may communicate directly with the User Agency, while concurrently furnishing full information with respect to the communication to the ACO. It will be noted, in this connection, that Item 11 of the 254 requires very specific information as to the identity of the source of information needed for purposes of clarification.

(*Continued on Page 37*)

FROM THE SPEAKERS ROSTRUM

Address by Dr. Eugene T. Ferraro, Dep. Under Secretary of the Air Force (Manpower), to the First Annual Symposium, Project ARISTOTLE, Washington, D. C., Dec. 7, 1967.

Project ARISTOTLE: The Present and Future

We are here today in response to a call which went out almost 18 months ago at a conference held in June 1966 on "Engineering Systems for Education and Training." This conference was jointly sponsored by the Defense Department, U.S. Office of Education, the Department of Labor, and the National Security Industrial Association (NSIA). It was one of the objectives of that conference to stimulate and maintain a continual momentum of interest in perpetuating a dialogue for the improvement of education and training.

- A dialogue which would engage all facets of our society.
- A dialogue which would challenge all elements of society—not just those elements traditionally and conventionally involved in the educational process.
- A dialogue designed to inspire a broad, interdisciplinary team effort which would concentrate upon training and education, identify problems, and continue the cooperative process of finding solutions.

The dialogue has continued for the past 18 months and has culminated in the formulation of Project ARISTOTLE, and this its first annual symposium. I have been associated with this program since its inception. Accordingly, I want to offer my observations and reflections.

Throughout these months, the Defense Department has maintained its interest in Project ARISTOTLE.

The articles which we have published in our *Defense Industry Bulletin*[1] have created a most favorable reaction. We have received literally hundreds of requests for information regarding ARISTOTLE.

We have sensed a desire to participate and cooperate on the part of educators, industrialists, and professional organizations.

To help people find both the motivation and focus for participation in ARISTOTLE, we must spell out for them the contexts in which it is placed.

It is a context of tremendous national scope.

It is estimated that for all types of schooling our national expenditures run some $50 billion per year.[2] The expenditure by industry in training its workers and managers is estimated in the tens of billions of dollars. Accordingly, in various educational institutions, industry, government agencies, and all kinds of professional organizations, expenditures in education and training may well approach $80 billion annually and, in the not too distant future, will approach $100 billion—up to 10 percent of our Gross National Product.

However, the dollar expenditure is but one element in establishing and assessing the importance and benefits of improved education and training systems.

We have come to recognize and appreciate fully education and training as:

- Enriching our cultural life.
- Enabling more of our people to become effective as citizens.
- Contributing enormously to economic growth by serving as investments, *i.e.*, by adding to the productivity of American labor as a capital investment.

It is in this context then—the socio-economic context of our national life—within which we must examine Project ARISTOTLE. It is in this view that we must seek answers to the following questions:

What has ARISTOTLE accomplished to date?

What form should ARISTOTLE take in the future?

Under an NSIA Steering Committee, chaired by Marvin Kahn, 10 functional task groups were formed to address the specific objectives "keynoted" in June 1966. The objectives of these 10 task groups were designed to interlock in such a way as to give thorough and systematic attention to all functional elements of a total educational system. The task groups were also designed to—and did—attract wide participation from persons and groups heretofore uninvolved in education on a national scale.

In the past day and a half we have seen the results of that planning. We have heard excellent expositions of the state of the art in computers, communications, trainers and simulators, evaluation standards, and media.

We have been given an exciting glimpse into the future—and perhaps not too distant future—of individualized instruction, biochemical learning, and sophisticated educational systems.

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[1] *"Status Report: Project ARISTOTLE,"* Defense Industry Bulletin, *Vol. 3, No. 8, September 1967, pp. 4–6.*
"Project ARISTOTLE," Defense Industry Bulletin, *Vol. 3, No. 3, March 1967, pp. 22–23.*

[2] *Remarks of the Honorable Samuel Ganz, Deputy Manpower Administrator, Department of Labor, "Proceedings of the Engineering Systems for Education and Training Conference," p. 156. (National Security Industrial Association, Washington, D.C. 1966.) (Dollar figure amended for FY 1967 estimate.)*

We have received excellent suggestions in several areas, such as instructor-training and utilization, and information interchange, which are of current and ongoing concern, not only to us in the Defense Department but to all concerned.

Finally, we have not forgotten that our initial and overall objective was to facilitate the matching of problems with potential solutions. We have given attention to the questions inherent in a government/education/industry interface.

All this evidence leads me to conclude that the basic task group structure of ARISTOTLE is sound, and should be continued.

We should continue emphasis upon periodic symposia where the results of the task group efforts can be disseminated.

We should give serious attention to compiling the work of the several task groups into proceedings to be published before these symposia so as to afford an opportunity for careful and critical review during the conference.

What has to be done, and by whom?

Let me orient myself from my vantage point of experience, and to you, who represent other fields, may I suggest you infer other orientations. In the Defense Department, our primary interest in education and training stems clearly from both a Presidential and Congressional mandate to procure and train manpower to develop, procure and employ weapons for our national security objectives.

We commit impressive amounts of resources, both dollars and manpower, to fulfill this mandate.

- Over $4 billion annually for education and training.
- One-tenth of our four and one-half million military and civilian personnel are in training at any given time; with one instructor or support personnel committed for each four trainees.

Yet, and this may surprise you, only 12 percent of our people are trained in skills directly associated with firing weapons of some sort. The remaining 88 percent are trained in:

- Technical skills—50 percent.
- Supply and administration—33 percent.
- Medical and dental specialties—5 percent.[3]

So our education and training problems are not too unlike those of the private sector.

Yet, added to this Service requirement for education and training which ultimately benefits the nation, we have recently assumed further responsibilities to contribute to the enhancement of our country's social goals.

In Project 100,000 we have seized an opportunity to make a meaningful impact on significant numbers of the nation's youth. We will take young people and start them on the road to become productive citizens with employable skills, and in the process aid in the achievement of our fundamental mission—the development of military manpower.

In Project TRANSITION we will give further opportunity to young men already headed in the right direction to reach even higher levels of personal and skill achievement.

Hence, historically and as currently assumed, the Defense Department has become a most effective part of the educational community, in its broadest concept.

Dr. Eugene T. Ferraro

Because our Armed Services have traditionally been innovators, we can exploit this kinship by serving as a laboratory wherein new techniques and equipment might be tested. We are a closed loop system—we train, we employ, we test, we improve and recycle continuously.

But we must remember the caveat of 1966 in this regard.[4]

We should not oversell this opportunity solely, or even primarily, as an opportunity for large contracts or profits. Rather, the values we will seek are to produce more effective men through more effective education and training. These are the values we share with everyone in the educational community or of which we are a part—a most significant one. Our basic job is education and training. These are the values we pledge to support, along with other government agencies and with society at large.

What should be the role and the responsibility in ARISTOTLE for educators, educational institutions, and their related professional organizations?

Our answer must be clear and emphatic—it is indeed the major role. The Defense Department has assumed further and significant obligations—as we have noted—to the American society. While these programs are of major national impact, they are small in comparison to the overall problems of education on a national scale.

Educators must continue to lead and guide our total national educational effort.

To this end educators and their professional associations must become a partner with Government and industry on a scale broader than ever before conceived. They must articulate the key problems we face as a nation cogently and forcefully. They must encourage and guide the application of the creativeness and talents of all other segments of our society to the solution of those problems. Finally, they must point the way for the involvement of a broad spectrum of academic disciplines in the social sciences and engineering, and indicate the alternatives industry may take in seeking the necessary marriage between the social sciences and engineering—specifically, education.

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[3] *Remarks of the Honorable Thomas D. Morris, Assistant Secretary of Defense (Manpower), "Proceedings for the Engineering Systems for Education and Training Conference," op cit., passim.*

[4] *Ibid., p. 13.*

What role should industrial organizations play?

To my view industry must stop, look and listen to the articulated requirements of educators, and to those expressed by various government agencies. This conference has provided that occasion.

Industry must be prepared to subject these requirements to the rigors of the methods of modern management. It must explicitly translate operational need into definable products (program definition). It must act as the catalyst in program design, development and implementation (the acquisition phase). It must give its attention to the costs and benefits of particular programs, to innovative analysis and novel approaches to problems, and to the application of advanced techniques which will provide visibility, structure, and direction to various optional programs.

Above all, it must proceed cautiously into the hardware phase, giving equal attention to all elements of the system.

Parenthetically, I would like to note two particularly good expositions on the application of the "systems approach" to education and training:

- The paper prepared by Task Group No. 6—Dr. Lehmann's group.
- The symposium on "Systems Analysis in Education", held by the U.S. Office of Education in Washington on November 20–22, 1967.

Education can never be the same with the application of these techniques.

Where do we go from here? Under what guidelines, toward what objectives, and with what leadership?

In his Denver speech to the National Association of Education Broadcasters on November 7, 1967, Secretary of Defense Robert McNamara suggested the appropriate answer. In his words:

> **This nation is immensely powerful—both in material and human resources.**
>
> **We can curb aggression abroad. And we can meet our pressing social problem here at home. And we can do both at the same time if we will use wisely existing institutions and available resources.**

With these guidelines, then, I suggest we go forward to the future.

- Continue ARISTOTLE in its task group format, changing the composition and subjects to meet changing needs.
- Look to educators and educational associations for the leadership, articulation and participation on the broadest and most intensive scale, and offer advice, counsel and urgings, as required.
- Continue to look to government agencies at all levels, local to national, for a definition of trends and needs which can be responded to by science and research in industry.
- Look to industry to recognize and appreciate that its involvement in education and training, while now significant, is but the beginning of a massive national and international effort which is at the root of increased productivity and creativity. Education is among the newest and most promising growth industry in our nation—in fact, in the world at large.

In the traditional American style, we are set on a new task of optimizing the potential of this new and great growth industry. To these ends, we must also follow the traditional American style of private initiative and private investment. Again, in a pluralistic way at every level of our Government and of society at large, education and training is everybody's business and the nation's total concern.

International Law of the Sea

(*Continued from Page 19*)

neither the installations nor their safety zones may be established if they interfere with the use of "recognized sea lanes essential to international navigation."[31] The importance of this provision is amply illustrated by the fact that there are already 21,000 structures associated with oil and gas exploitation in the Gulf of Mexico alone.

The Continental Shelf Convention is, prospectively, the most important of the four conventions adopted at Geneva, converting, as it has, unilateral state claims into a rather comprehensive codification of international law. As mentioned previously, Article 1 defines the continental shelf as an area adjacent to the coast to a depth of 200 meters[32] or, beyond that limit, to the extent that the depth of the water permits exploitation of the natural resources. This is an open-ended definition—*depth of 200 meters or depth of exploitability.* Although the "exploitability" test does *not* meet the normal legal requirement of certainty, it does have the advantage of flexibility and makes the Convention applicable without change to future situations brought about by increasing success in exploring the oceans. Of course, this second criterion tends to make the scope of the Convention ambiguous and has already created heated discussions among international lawyers.

Although the Convention on the Continental Shelf does not solve all of the legal problems that will arise in the future exploitation of this area, it will certainly provide a sound foundation for the orderly development of the ocean's shelf resources. Considering the embryonic stage of ocean technology and the relative accessibility of shelf as opposed to deep ocean resources, it is reasonable to predict that increasingly numerous conflicts of uses will arise on and over the continental shelf. Thus, in a practical sense, the Convention codifies a system of order responsive to the needs of today.

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[29] *Id.*, art. 5, par. 1. The need for this provision is apparent when it is considered that there are already shelf platforms in existence which cover more than 1 acre and extend 300 feet in the air. The problem of balancing the conflict between exploitation of the continental shelf and other uses, particularly that between oil and gas extraction and fishing, is becoming a matter of increasing public concern. See H.R. 11460, H.R. 11584, H.R. 11984, H.R. 11988, and H.R. 12007, 90th Cong. 1st Sess. (1967) (all concern the establishment of marine sanctuaries and would place a moratorium on development of the continental shelf in designated areas).

[30] Continental Shelf Convention, *supra* note 10, art. 5, pars. 2 and 3.

[31] *Id.*, art. 5, par. 6.

[32] 656 feet; 109.33 fathoms.

DOD-Industry Group Formed To Deal with Resource Management Problems

The establishment of the DOD-Industry Assets Management Systems Advisory Committee has been approved by the Assistant Secretary of Defense (Administration). The committee is comprised of representatives of Office of the Secretary of Defense staff offices, the Defense Supply Agency, the Military Services, and recognized industry associations representing defense contractors in aerospace, automotive, electronic and shipbuilding industries.

Purpose of the committee is to provide a channel for the industrial community and DOD representatives to discuss problems involved in the implementation of Resource Management Systems. These systems provide DOD and industrial managers with information necessary to evaluate contractual progress and the utilization of labor, technical skills, materials and other resources involved in major defense contracts.

The committee is guided by a charter and by the stated objectives of DOD Directive 7000.1, "Resource Management Systems of the DOD." Functions of the committee, as stated in the charter, are to:

- Serve as a nucleus for constructive DOD-industry collaboration in the implementation of Resource Management Systems.
- Provide timely information from industry to DOD concerning current implementation problems, associated with the installation of Resource Management Systems, that affect both DOD and industry.
- Consider industry-recommended solutions to implementation problems of Resource Management Systems.
- Recommend, where possible, solutions to implementation problems on Resource Management Systems.

Colonel Herbert Waldman, USAF, Director for Assets Management Systems, Office of the Assistant Secretary of Defense (Comptroller), is the chairman of the committee. Other DOD members are:

E. J. Engoron
Office of the Director, Defense Research and Engineering

E. B. Bennewitz
Office of the Assistant Secretary of Defense (Installations and Logistics)

Dr. D. Rice
Office of the Assistant Secretary of Defense (Systems Analysis)

R. E. McKelvey
Office of the Assistant Secretary of the Army (Financial Management)

Earl Kuhl
Office of the Special Assistant to the Secretary of the Navy for Management Information

A. E. Fitzgerald
Office of the Assistant Secretary of the Air Force (Financial Management)

J. R. Jones Sr.
Defense Supply Agency

Members of the committee who represent industry are:

Stanley M. Sjosten
National Security Industrial Association (Melpar, Inc.)

William L. Dewey
Automobile Manufacturers Association (Chrysler Corp.)

C. Ronald Millkin
National Aerospace Services Association (United Aircraft Corp.)

Philip A. Huey
National Association of Manufacturers (North American Rockwell Corp.)

Gerald R. Marks
Shipbuilders Council of America (General Dynamics Corp.)

G. L. Warrick
Aerospace Industries Association (General Electric Co.)

Charles Macbeth
Western Electronic Manufacturers Association (Hughes Aircraft Co.)

Additional information regarding the committee can be obtained from J. M. Turner, Aerospace Industries Association, 1725 DeSales St. NW, Washington, D.C. 20036, Phone (202) 347–2315, who is the project officer for the Council of Defense and Space Industry Associations; or from Lieutenant Colonel W. J. Mehl, Office of the Assistant Secretary of Defense (Comptroller), Room 1B 669, The Pentagon, Washington, D.C. 20301, Phone (202) OXford 7–7514.

Challenge of Marine Sciences

(*Continued from Page 6*)

mission and the council are independent, we are at the same time working harmoniously together toward common goals. We are looking forward to the commission's recommendations to the President and to the Congress concerning a national plan and the most appropriate future structure of the Federal Government to carry out statutory purposes.

Most of the mysteries of the sea remain cloaked before us. Most of its resources remain untapped. Most of its potential to serve national goals remains unawakened. To realize this opportunity depends on a creative partnership of our Federal Government with the states, with universities and research organizations, and with industry.

We also look forward to increased activities by other nations with whom we seek further international cooperation and collaboration—in scientific research and in a framework of law by which the sea may serve all men.

Pure logic and practical economics dictate this program. However, not to be forgotten is man's compelling desire to explore and to understand the world around him. The spirit which has carried us to rugged mountain peaks, remote polar icecaps, and distant reaches of outer space now propels us to the ocean deeps. This spirit is fortified with a confidence developed by past contributions of science that we will not only conquer the ocean deeps, but will use them in satisfying the needs of our society.

Joint Packaging Symposium To Be Held Feb. 5-7, 1968

The National Security Industrial Association will team up again this year with the Government and Military Services to sponsor a Joint Packaging, Materials Handling and Transportation Symposium and Exposition, to be held Feb. 5-7 at the Sheraton Park Hotel, Washington, D.C.

Assistant Secretary of Defense (Installations and Logistics) Thomas B. Morris will present the keynote address on the morning of the first day. Feature attraction of the afternoon will be a panel of senior representatives from the four Services to address attendees on the "Logistic Requirements for the Forward Area."

Containerization is the theme for the entire second day of the program. The morning sessions will be devoted to an appraisal of the state of the art, and the afternoon will be dedicated to a panel discussion on "The Implications of Military Usage."

The third day's program, which is a morning meeting only, will be devoted to the military's "Future Developments in Distribution."

The contact for additional information on the symposium is:

Floyd B. T. Myhre
National Security
Industrial Association
1030 15th St. NW
Washington, D. C. 20005
Phone: (202) 296–2266

Large Press Study Contracts Awarded

The Air Force has named three contractors to study possible designs for a large hydraulic closed die forging press.

Companies awarded contracts were: Aluminum Co. of America, Pittsburgh, Pa.; Wyman-Gordon Co., Worcester, Mass., and the Ladish Co., Cudahy, Wis.

Value of the three contracts totals $76,850.

Air Force Systems Command's Materials Laboratory, Wright-Patterson AFB, Ohio, is sponsoring the program through its manufacturing Technology Division. Ted S. Felker is the project engineer.

Oceanography Study Kits Available

Ocean Science Study Kits especially suited for students and teachers, prepared by the U.S. Naval Oceanographic Office, are available for public purchase. The kits have been assembled to provide secondary schools with interesting information on the rapidly developing fields of oceanography and ocean engineering.

The student kits are composed primarily of reading materials and charts selected for interest to students of high school age. In addition, several exercises are included which will give the student first-hand experience in contouring, charting, and data interpretation.

The teacher kits contain the same information, with additional material to give the teacher background in providing guidance to the student.

These kits are priced at $3.20 each for the teacher kit, and $1.60 each for the student kit. Purchase requests should be accompanied by a check or money order made payable to the U.S. Naval Oceanographic Office.

Mail orders from purchasers located west of the Mississippi River should be sent to: Naval Oceanographic Distribution Office, Clearfield, Utah 84016. Orders from all other locations should be addressed to: Naval Oceanographic Distribution Office, 5801 Tabor Ave., Philadelphia, Pa. 19120.

High Quality Potatoes Pay Off for Small Company

One of the smallest of the many small firms doing business with the Defense Department has been cited for the extremely high quality of its product.

The John Misich Co. of Snohomish, Wash., has been given the Defense Personnel Support Center's quality award for supplying 3.5 million pounds of potatoes, most of them for troops overseas, without a single product rejection for quality.

Primarily a family operation, the company is engaged in farming and packing potatoes, and has an average of 10 full- or part-time employees. They include firm president John Misich, his wife who works in the office, and a son who works in the warehouse and in the field.

An active bidder on government potato procurements since 1963, the firm holds the record for the largest potato contract awarded by the Defense Personnel Support Center's Seattle Subsistence Regional Headquarters, a $53,160 contract awarded in December 1966.

The quality award was presented to the firm during formal ceremonies at the Seattle headquarters by Colonel Donald G. Bussey, USAF, Deputy Commander, Defense Personnel Support Center. The company will receive a "Q" flag which it can fly over its main building.

Airline Assists Lady Marines

The international appeal of an airline stewardess has been adopted as the 1968 model for the women of the U.S. Marine Corps.

Since February 1967, 20 women marines have reported, two at a time, for a one-week tour of duty in the grooming laboratory of Pan American World Airways' International Stewardess School in Miami, Fla. Their mission is to learn how the glamorous and gracious airline stewardess gets that way, and to bring back the secret to the Marine Corps.

The young women, who have completed Pan American's image development course, have already carried the program to major Marine bases in Hawaii, California, and North and South Carolina. In addition, a grooming laboratory has been established in Quantico, Va., where the Marine Corps trains its women officers.

Extremely popular with the women trainees, the new emphasis on image development is viewed with equal enthusiasm by former Lady Leathernecks, who on Feb. 13 will join their active duty sisters in celebrating the 25th anniversary of the Women Marines. The general consensus is that, after 25 years, the women have finally arrived at their own version of the Corps' traditional spit and polish.

MEETINGS AND SYMPOSIA

APRIL

Second National Conference on **Space Maintenance and Extra-Vehicular Activities**, April (date undetermined), at Las Vegas, Nev. Sponsors: Air Force Aero Propulsion Laboratory, LTV, Inc., and National Aeronautics and Space Administration. Contact: Mr. Clodfelter, (APFT), Air Force Aero Propulsion Laboratory, Wright-Patterson AFB, Ohio 45433, Phone (513) 257-1110, Ext. 55875.

International Conference on **Light Scattering Spectra in Solids**, April (date undetermined), at U. S. Army Research-Durham, Durham, N. C. Sponsor: U. S. Army Research Office—Durham. Contact: Dr. Charles Boghosian, Physics Div., U. S. Army Research Office-Durham, Box CM, Duke Station, Durham, N. C. 27706, Phone (919) 286-2285, Ext. 34.

Symposium on the **Structure of Low Medium Mass Nuclei**, April (date undetermined), at University of Kansas, Lawrence, Kan. Sponsors: Aerospace Research Laboratories, University of Kansas and North Carolina State University. Contact: Dr. G. I. Harris, (ARP), Aerospace Research Laboratories, Wright-Patterson AFB, Ohio 45433, Phone (513) 255-3613.

Fifth Symposium on **Remote Sensing of Environment**, April 16-18, at University of Michigan, Ann Arbor, Mich. Sponsors: Office of Aerospace Research, Office of Naval Research and Department of Agriculture. Contact: C. E. Molineaux, (CRJT), Air Force Cambridge Research Laboratories, L. G. Hanscom Field, Bedford, Mass. 01730, Phone (617) 274-6100, Ext. 3620.

International Symposium on **Turbulence of Fluids and Plasmas**, April 16-18, at Waldorf-Astoria Hotel, New York, N. Y. Sponsors: Microwave Research Institute of Polytechnic Institute of Brooklyn, Air Force Office of Scientific Research, Office of Naval Research and Department of the Army. Contact: Lt. Col. Robert B. Kalisch, Air Force Office of Scientific Research, 1400 Wilson Blvd., Arlington, Va. 22209, Phone (202) OXford 4-5518; or Jerome Fox, Polytechnic Institute of Brooklyn, 333 Jay St., Brooklyn, N. Y. 11201, Phone (212) 643-2393.

Conference on **Atomic Physics**, April 17-20, in New York, N. Y. Sponsor: Office of Aerospace Research. Contact: D. L. Wennersten, (SRPP), Air Force Office of Scientific Research, 1400 Wilson Blvd., Arlington, Va. 22209, Phone (202) OXford 4-5454.

Photochemistry and Radiation Chemistry Symposium, April 22-24, location undetermined. Co-sponsors: U. S. Army Natick Laboratories and National Academy of Sciences-National Research Council Advisory Board. Contact: Dr. E. Hayon, Head, Physical Chemistry Laboratory, U. S. Army Natick Laboratories, Natick, Mass. 01760, Phone (617) 653-1000, Ext. 137.

Annual **Frequency Control** Symposium, April 22-24, at Shelburne Hotel, Atlantic City, N. J. Sponsor: Electronic Components Laboratory, U. S. Army Electronics Command. Contact: Dir., Electronics Components Laboratory, U. S. Army Electronics Command, Attn.: AMSEL-KL-ST, M. F. Timm, Fort Monmouth, N. J. 07703, Phone (201) 535-2826.

MAY

Second International Conference on **Vacuum Ultraviolet Radiation Physics-Interaction with Solids**, May 1-3, at Gatlinburg, Tenn. Co-sponsors: U. S. Army Research Office-Durham and Office of Naval Research. Contact: Dr. Robert Mace, Dir., Physics Div., U. S. Army Research Office-Durham, Box CM, Duke Station, Durham, N. C. 27706, Phone (919) 286-2285.

Fifth National Colloquium on **Information Retrieval**, May 3-4, at University of Pennsylvania, Philadelphia, Pa. Sponsors: Moore School of Electrical Engineering, University of Pennsylvania, Institute of Electrical and Electronics Engineers, Special Interest Group on Information Retrieval, American Documentation Institute, Association for Computing Machinery and Frankford Arsenal. Contact: George Schecter, Chief, Objectives Analysis Office, Frankford Arsenal, Philadelphia, Pa. 19137, Phone (215) JE 5-2900, Ext. 3219.

Fourth International Conference on **Universal Aspects of Atmospheric Electricity**, May 12-18, in Tokyo, Japan. Sponsors: Air Force Cambridge Research Laboratories, Office of Naval Research and National Science Foundation. Contact: Capt. J. H. Shock, (CRTE), Air Force Cambridge Research Laboratories, L. G. Hanscom Field, Bedford, Mass. 01730, Phone (617) 274-6100, Ext. 3636.

Security Classification

(*Continued from Page 31*)

A few comments are necessary with respect to the completion of Item 14 of the 254. It is in this item that the authenticating PCO or ACO must place his signature. The formula for completing this item is as follows: On all 254s addressed to prime contractors or provided in connection with an RFQ, RFP, or IFB issued to potential prime contractors, the signature line and Item 14a will be completed; Item 14b will be marked not applicable. In all other cases, the signature line and both Item 14a and 14b will be completed.

The fundamental objective of the new plan of providing security classification guidance for the defense industry is to assure that the User Agencies will assume and fulfill their responsibility in providing classification guidance in the form of an itemized list of specific areas of information, with comprehensive narrative comment to fill out the individual aspects of each of those areas; to assure the currency of this guidance; and to motivate and facilitate candid, orderly, and objective intercommunication between the parties on both sides of the contract. It is believed that the new plan has significantly clarified the relationship of the parties to a 254, and has reduced the overall administrative burden of preparing, issuing, distributing and reviewing these documents.

SELECTED DEFENSE DEPARTMENT ECONOMIC INDICATORS

(Dollars in Millions, Manpower in Thousands, Quarters by Calendar Year)

	1966				1967							
	I	II	III	IV	I	II	Jul	Aug	Sep	III	Oct	Nov
I. *Military Prime Contract Awards*												
Aircraft	$ 1,945	$ 2,989	$ 2,696	$ 2,262	$ 2,102	$ 3,049	$ 394	$ 636	$1,483	$ 2,513	$1,249	$ 578
Missile & Space Systems	1,040	987	1,314	861	1,230	1,166	535	521	524	1,580	323	429
Ships	355	491	876	239	679	407	178	104	135	417	153	147
Weapons & Ammunition	555	1,486	692	940	818	1,769	92	415	597	1,104	454	451
Electronic & Communications Equip.	918	1,574	666	915	971	1,848	169	364	283	816	272	247
Other Hard Goods	843	1,842	660	1,029	915	1,564	202	355	228	785	252	153
Soft Goods	709	922	1,078	989	638	652	588	280	188	1,056	175	118
Construction	207	392	198	150	232	626	56	100	76	232	56	44
All Other	1,406	1,963	2,356	1,639	1,605	1,987	1,194	568	573	2,335	522	486 (p)
Total (Excl. Work Outside U.S.)	7,978	12,646	10,536	9,024	9,190	13,068	3,408	3,343	4,087	10,838	3,456	2,653 (p)
Total Seasonably Adjusted	8,703	10,144	10,716	10,149	10,171	10,667	3,610	3,686	3,665	10,961	3,665	3,329 (p)
Work Outside U.S.	521	1,195	856	672	453	834	314	382	195	891	193	118 (p)
II. *Gross Obligations Incurred*												
Operations	8,326	9,604	10,426	9,702	10,229	11,435	3,700	3,835	3,689	11,224	3,776	
Procurement	4,374	8,539	5,368	5,276	5,113	8,948	1,045	1,894	3,215	6,154	2,699	
Other	2,429	3,470	3,453	2,230	2,519	3,510	1,246	1,062	1,112	3,420	860	
Total	15,129	21,613	19,247	17,208	17,861	23,893	5,991	6,791	8,016	20,798	7,335	
III. *Gross Unpaid Obligations Outstanding*												
Operations	3,828	3,777	4,792	5,024	4,644	4,513	NA	5,115	5,267	5,267	5,270	
Procurement	18,023	22,119	22,736	23,173	22,780	25,248	NA	23,874	24,925	24,925	25,423	
Other	5,747	7,392	8,179	7,888	7,626	8,270	NA	8,559	8,722	8,722	8,599	
Total	27,598	33,288	35,707	36,085	35,050	38,031	NA	37,548	38,914	38,914	39,292	
IV. *Net Expenditures*												
Operations	7,689	9,076	8,968	9,087	10,002	10,731	2,898	3,722	3,382	10,001	3,641	3,456
Procurement	3,651	3,886	4,392	4,264	5,074	5,282	2,037	1,982	2,041	6,060	2,005	1,890
Other	2,757	2,647	2,484	3,092	3,179	2,001	1,231	883	933	3,047	789	846
Total	14,097	15,609	15,844	16,443	18,255	18,014	6,166	6,587	6,356	19,108	6,435	6,192
V. *DOD Personal Compensation*												
Military	3,181	3,249	3,551	3,606	3,624	3,646	1,310	1,260	1,272	3,842		
Civilian	1,937	2,015	2,105	2,135	2,170	2,248	736	793	742	2,271	773	775 (p)
Total	5,118	5,264	5,656	5,741	5,794	5,894	2,046	2,053	2,014	6,113		
VI. *Outstanding Payments*												
Advance Payments	66	79	90	83	92	80				110		
Progress Payments	4,402	4,346	4,750	5,461	5,981	6,765				7,179		
Total	4,468	4,425	4,840	5,544	6,073	6,845				7,289		
VII. *Strength* (*Manpower*)												
Military	2,969	3,094	3,229	3,334	3,371	3,377	3,382	3,393	3,412	3,412	3,416 (p)	
Civilian	1,088	1,138	1,184	1,230	1,268	1,303	1,311	1,306	1,274	1,274	1,277	1,277 (p)

NA=Not Available
p =Preliminary
Note: Open spaces for Indicators other than No. VI indicate information not available at time of publication.
Indicator No. VI information available only on a quarterly basis.

Directorate for Statistical Services
OASD (Comptroller)
Dec. 28, 1967

STATUS OF FUNDS

DEPARTMENT OF DEFENSE

Military Functions and Military Assistance Program

Quarterly Report

Prepared by:

Directorate for Financial Analysis and Control
Office of the Assistant Secretary of Defense (Comptroller)
Room 3C 839, The Pentagon Phone: (202) OXford 7-2332

NOTE: All expenditure amounts are on a net Treasury basis (gross payments less reimbursement collections), whereas obligations and unpaid obligations are on a gross basis (inclusive of reimbursable activity performed by components of DOD for each other). Therefore, unpaid obligations as of the end of the reporting month cannot be computed from other figures in this report.

Expenditures

First Quarter, Fiscal Year 1968

(Amounts in Thousands)

DEPARTMENT OF DEFENSE

	Expenditures				Unpaid obligations	
	July 1967	Aug. 1967	Sept. 1967	Cum. thru Sept. 30, 1967	At start of year	As of Sept. 30, 1967
Military Personnel						
Active forces	1,217,423	1,544,372	1,522,525	4,284,320	850,076	1,212,519
Reserve forces	135,494	132,697	37,425	305,616	149,863	123,766
Retired pay	163,448	166,985	167,152	497,585	7,622	6,465
Undistributed	78,414	−16,946	37,751	99,219	—	−99,219
Total—Military Personnel	1,594,779	1,827,107	1,764,853	5,186,739	1,007,561	1,243,531
Operation and Maintenance	1,303,172	1,894,523	1,616,697	4,814,392	3,542,486	4,023,587
Procurement						
Aircraft	781,968	853,017	813,632	2,448,617	9,317,974	8,765,933
Missiles	195,134	161,789	150,406	507,329	1,929,015	1,867,649
Ships	104,941	115,715	131,016	351,672	3,049,781	3,010,393
Tracked combat vehicles	25,913	42,853	25,757	94,523	632,680	695,979
Ordnance, vehicles, and related equipment	580,756	452,477	523,648	1,556,881	6,721,730	7,382,390
Electronics and communications	89,708	96,770	139,661	326,139	1,998,176	1,987,918
Other procurement	5,139	281,706	124,948	411,793	1,947,502	1,972,914
Undistributed	253,783	−22,750	131,948	362,981	−386,056	−757,752
Total—Procurement	2,037,342	1,981,580	2,041,015	6,059,937	25,210,802	24,925,421
Research, Development, Test, and Evaluation						
Military sciences	82,373	98,419	74,072	254,864	867,381	826,678
Aircraft	99,615	85,906	116,473	301,994	796,125	915,226
Missiles	197,681	240,774	200,876	639,331	1,095,907	1,608,433
Astronautics	141,723	91,004	85,193	317,920	649,793	618,917
Ships	39,303	31,410	23,105	93,818	212,773	224,357
Ordnance, vehicles, and related equipment	24,510	34,682	28,938	88,130	235,442	261,416
Other equipment	54,148	63,184	63,882	181,214	541,757	571,005
Program-wide management and support	39,650	37,048	40,505	117,203	163,038	174,340
Undistributed	86,404	29,816	39,057	155,277	−194,032	−350.352
Total—Research, Development, Test, & Eval.	765,409	712,242	672,099	2,149,750	4,368,185	4,850,058
Military Construction	105,390	126,470	99,037	330,897	1,581,256	1,475,628
Family Housing	40,655	44,780	44,282	129,717	114,964	151,981
Civil Defense	1,872	13,870	9,683	25,425	91,893	80,340
Other—Special Foreign Currency Program	26	40	41	107	2,193	2,086
Revolving and Management Funds	302,615	−42,408	83,293	343,500	527,834	234,297
Subtotal—Military Functions	6,151,260	6,558,205	6,330,999	19,040,464	36,447,172	36,986,927
Military Assistance	15,077	27,575	24,579	67,231	2,112,357	2,161,842
TOTAL—DEPARTMENT OF DEFENSE	6,166,337	6,585,780	6,355,577	19,107,694	38,559,529	39,148,769

NOTE: Detail may not add to rounded totals.

DEPARTMENT OF THE ARMY

	Expenditures				Unpaid obligations	
	July 1967	Aug. 1967	Sept. 1967	Cum. thru Sept. 30, 1967	At start of year	As of Sept. 30, 1967
Military Personnel						
Active forces	418,815	612,951	648,592	1,680,358	392,872	602,924
Reserve forces	101,491	102,645	15,786	219,922	112,152	82,694
Undistributed	63,721	–24,895	32,021	70,847	–	–70,847
Total—Military Personnel	584,027	690,701	696,399	1,971,127	505,024	614,771
Operation and Maintenance	401,731	636,103	620,206	1,658,040	1,252,029	1,565,353
Procurement						
Aircraft	82,765	101,937	92,367	277,069	1,303,735	1,154,350
Missiles	32,512	49,898	–15,470	66,940	458,264	450,092
Tracked combat vehicles	25,872	42,759	25,228	93,859	611,133	672,833
Ordnance, vehicles, and related equipment	202,125	251,434	244,080	697,639	3,387,912	3,739,707
Electronics and communications	7,055	27,620	56,145	90,820	780,554	844,432
Other procurement	7,241	57,528	63,051	127,820	817,300	866,795
Undistributed	238,697	–26,330	132,185	344,552	–386,056	–739,330
Total—Procurement	596,266	504,848	597,585	1,698,699	6,972,842	6,998,879
Research, Development, Test, and Evaluation						
Military sciences	13,387	14,251	8,601	36,139	133,665	143,285
Aircraft	17,868	9,920	15,262	43,050	85,463	104,373
Missiles	51,305	62,052	53,355	166,712	435,876	600,544
Astronautics	645	3,004	2,313	5,962	15,069	12,200
Ordnance, vehicles, and related equipment	9,799	17,836	13,565	41,200	136,432	162,851
Other equipment	19,112	24,207	22,707	66,026	218,437	226,438
Program-wide management and support	7,067	6,235	8,901	22,203	39,835	46,612
Undistributed	74,408	22,935	24,121	121,464	–194,032	–316,544
Total—Research, Development, Test, & Eval.	193,492	160,439	148,824	502,755	870,745	979,759
Military Construction	50,246	158,895	36,803	245,944	818,076	666,348
Revolving and Management Funds	173,143	–58,597	71,871	186,417	58,732	– 69,801
TOTAL—DEPARTMENT OF THE ARMY	1,998,904	2,092,390	2,171,687	6,262,981	10,477,449	10,745,307

DEPARTMENT OF THE NAVY

	Expenditures				Unpaid obligations	
	July 1967	Aug. 1967	Sept. 1967	Cum. thru Sept. 30, 1967	At start of year	As of Sept. 30, 1967
Military Personnel						
Active forces	355,829	455,409	418,431	1,229,669	232,405	346,514
Reserve forces	14,127	16,081	12,059	42,267	19,698	20,146
Undistributed	14,638	−14,547	12,036	12,127	—	−12,127
Total—Military Personnel	384,594	456,943	442,526	1,284,063	252,103	354,533
Operation and Maintenance	393,573	609,630	396,437	1,399,640	1,234,696	1,170,381
Procurement						
Aircraft	240,244	248,355	248,450	737,049	3,505,672	3,036,480
Missiles	54,257	25,600	44,242	124,099	470,557	486,888
Ships	104,941	115,715	131,016	351,672	3,049,781	3,010,393
Tracked combat vehicles	41	94	529	664	21,547	23,146
Ordnance, vehicles, and related equipment	142,312	80,727	123,141	346,180	1,611,746	1,651,914
Electronics and communications	33,263	35,309	42,786	111,358	656,377	595,859
Other procurement	62,728	55,697	60,359	178,784	921,116	933,209
Undistributed	7,705	−2,821	3,878	8,762	—	−8,762
Total—Procurement	645,491	558,678	654,400	1,858,569	10,236,796	9,729,125
Research, Development, Test, and Evaluation						
Military sciences	18,424	19,761	11,161	49,346	127,323	139,897
Aircraft	25,869	25,239	23,714	74,822	260,838	242,908
Missiles	68,873	95,267	74,592	238,732	293,783	514,756
Astronautics	4,005	1,631	1,359	6,995	12,677	10,975
Ships	39,303	31,410	23,105	93,818	212,773	224,357
Ordnance, vehicles, and related equipment	14,711	16,846	15,373	46,930	99,010	98,565
Other equipment	14,973	8,499	9,964	33,436	89,328	86,134
Program-wide management and support	14,515	9,604	6,763	30,882	97,989	85,339
Undistributed	4,848	−217	2,889	7,520	—	−7,520
Total—Research, Development, Test, & Eval.	205,521	208,040	168,920	582,481	1,193,721	1,395,412
Military Construction	21,947	−80,429	20,591	−31,891	269,300	348,561
Revolving and Management Funds	−57,632	−22,147	60,363	−19,416	462,849	362,848
TOTAL—DEPARTMENT OF THE NAVY	1,593,495	1,730,714	1,749,237	5,073,446	13,649,465	13,360,857

DEPARTMENT OF THE AIR FORCE

	Expenditures				Unpaid obligations	
	July 1967	Aug. 1967	Sept. 1967	Cum. thru Sept. 30, 1967	At start of year	As of Sept. 30, 1967
Military Personnel						
Active forces	442,779	476,012	455,502	1,374,293	224,799	263,081
Reserve forces	19,876	13,971	9,580	43,427	18,013	20,926
Undistributed	55	22,496	−6,306	16,245	—	−16,245
Total—Military Personnel	462,710	512,479	458,776	1,433,965	242,812	267,762
Operation and Maintenance	431,020	554,374	518,796	1,504,190	955,856	1,188,281
Procurement						
Aircraft	458,959	502,725	472,815	1,434,499	4,508,567	4,575,103
Missiles	108,365	86,291	121,634	316,290	1,000,194	930,669
Ordnance, vehicles & related equipment	235,870	120,099	156,121	512,090	1,719,842	1,988,769
Electronics and communications	48,598	32,849	40,281	121,728	555,915	543,086
Other procurement	−64,917	164,299	1,208	100,590	164,740	127,248
Undistributed	7,900	5,696	−4,254	9,342	—	−9,335
Total—Procurement	794,776	911,958	787,805	2,494,539	7,949,258	8,155,540
Research, Development, Test, and Evaluation						
Military sciences	14,168	11,958	14,704	40,830	131,619	121,448
Aircraft	55,878	50,747	77,497	184,122	449,824	567,985
Missiles	77,503	83,455	72,929	233,887	366,248	493,133
Astronautics	137,073	86,369	81,521	304,963	622,047	595,742
Other equipment	20,063	30,478	31,211	81,752	233,992	258,433
Program-wide management and support	18,068	21,209	24,841	64,118	25,214	42,389
Undistributed	7,148	7,098	12,047	26,293	—	−26,293
Total—Research, Development, Test & Eval.	329,902	291,314	314,749	935,965	1,828,944	2,052,839
Military Construction	31,998	45,169	35,462	112,629	473,206	442,752
Revolving and Management Funds	21,356	68,778	−30,879	59,255	6,252	−42,131
TOTAL—DEPARTMENT OF THE AIR FORCE	2,071,761	2,384,072	2,084,710	6,540,543	11,456,328	12,065,044

DEFENSE AGENCIES/OFFICE OF THE SECRETARY OF DEFENSE

	Expenditures				Unpaid obligations	
	July 1967	Aug. 1967	Sept. 1967	Cum. thru Sept. 30, 1967	At start of year	As of Sept. 30, 1967
Military Personnel						
Retired pay	163,448	166,985	167,152	497,585	7,622	6,465
Operation and Maintenance	76,849	94,415	81,258	252,522	99,905	99,572
Procurement						
Ordnance, vehicles, and related equipment	449	217	306	972	2,230	2,000
Electronics and communications	792	992	449	2,233	5,330	4,541
Other procurement	87	4,182	330	4,599	44,346	45,662
Undistributed	−519	705	139	325	—	−325
Total—Procurement	809	6,096	1,225	8,130	51,906	51,877
Research, Development, Test, and Evaluation						
Military sciences	36,494	52,449	39,606	128,549	474,774	422,084
Military Construction	1,200	2,834	181	4,215	20,674	17,967
Family Housing	40,655	44,780	44,282	129,717	114,964	151,981
Other—Special Foreign Currency Program	26	40	41	107	2,193	2,086
Revolving and Management Funds	165,748	−30,441	−18,063	117,244	—	−16,619
TOTAL—DEFENSE AGENCIES/OSD	485,228	337,160	315,680	1,138,068	772,037	735,379

OFFICE OF CIVIL DEFENSE

Civil Defense	1,872	13,870	9,683	25,425	91,893	80,340
Revolving and Management Funds	—	—	—	—	—	—
TOTAL—OFFICE OF CIVIL DEFENSE	1,872	13,870	9,683	25,425	91,893	80,340

MILITARY ASSISTANCE

Military Personnel	—	9	23	32	525	529
Operation and Maintenance	9,911	18,399	21,293	49,603	289,568	340,412
Procurement						
Aircraft	1,045	4,920	10,973	16,938	235,101	232,756
Missiles	348	152	148	648	23,650	22,602
Ships	43	655	876	1,574	114,450	118,938
Ordnance, vehicles, and related equipment	7,909	770	7,848	16,527	264,633	271,860
Electronics and communications	7,918	1,989	2,301	12,208	132,402	129,788
Other procurement	5,102	168	1,324	6,594	127,226	133,531
Total—Procurement	22,365	8,654	23,470	54,489	897,462	909,475
Research, Development, Test, and Evaluation	—	−1	−1,076	−1,077	401	176
Military Construction	1,291	412	1,383	3,086	171,824	168,380
Revolving Fund	−15,465	−1,232	−16,053	−32,750	764,607	740,637
Undistributed	−3,024	1,334	−4,463	−6,153	−12,030	2,234
TOTAL—MILITARY ASSISTACE	15,077	27,575	24,579	67,231	2,112,357	2,161,842

Obligations

First Quarter, Fiscal Year 1968
(Amounts in Thousands)

DEPARTMENT OF DEFENSE

	Available for obligation	Obligations				Unobligated balance Sept. 30, 1967
		July 1967	Aug. 1967	Sept. 1967	Cum. thru Sept. 30, 1967	
Military Personnel						
Active forces	19,008,259	1,608,760	1,543,081	1,547,239	4,699,080	14,309,179
Reserve forces	958,775	127,776	96,517	57,184	281,477	677,298
Retired pay	2,020,000	163,554	165,448	167,310	496,312	1,523,688
Total—Military Personnel	21,987,034	1,900,090	1,805,047	1,771,734	5,476,871	16,510,163
Operation and Maintenance	21,038,712	1,799,809	2,029,598	1,917,371	5,746,778	15,291,933
Procurement						
Aircraft	12,568,379	368,567	201,444	1,420,862	1,990,873	10,577,508
Missiles	2,987,902	63,425	140,384	276,303	480,112	2,507,790
Ships	4,617,146	117,656	57,684	155,997	331,337	4,285,809
Tracked combat vehicles	346,561	32,519	103,416	23,282	159,217	187,344
Ordnance, vehicles and related equipment	8,288,313	295,510	1,040,214	1,055,758	2,391,482	5,896,831
Electronics and communications	1,828,122	78,388	139,506	116,706	334,600	1,493,522
Other procurement	2,529,417	89,172	211,268	165,855	466,295	2,063,122
Undistributed	2,630,944	—	—	—	—	2,630,944
Total—Procurement	36,796,785	1,045,235	1,893,918	3,214,761	6,153,914	29,642,872
Research, Development, Test, & Evaluation						
Military sciences	1,044,186	70,298	71,677	83,071	225,046	819,140
Aircraft	1,222,397	253,412	107,956	66,789	428,157	794,240
Missiles	2,250,324	299,773	360,280	515,217	1,175,270	1,075,054
Astronautics	1,322,631	199,553	48,716	75,763	324,032	998,599
Ships	178,775	39,409	47,453	24,076	110,938	67,837
Ordnance, vehicles, and related equipment	284,919	24,292	56,576	37,270	118,138	166,781
Other equipment	807,434	72,584	73,028	70,614	216,226	591,208
Program-wide management and support	475,718	68,748	53,367	54,137	176,252	299,466
Emergency Fund	100,000	—	—	—	—	100,000
Undistributed	852,187	−2,152	2,642	−490	—	852,187
Total—Research, Development, Test, & Eval.	8,538,574	1,025,913	821,699	926,447	2,774,059	5,764,515
Military Construction	[a]1,761,443	66,846	118,211	113,205	298,262	1,463,181
Family Housing	[a]310,335	889	112,158	55,488	168,535	141,800
Civil Defense	[a]32,544	5,316	4,967	3,873	14,156	18,389
Other—Special Foreign Currency Program	16,344	511	—	−511	—	16,344
Subtotal—Military Functions	89,481,772	5,844,610	6,785,598	8,002,367	20,632,575	68,849,198
Military Assistance	[a]396,883	146,736	4,829	13,760	165,325	231,557
TOTAL—DEPARTMENT OF DEFENSE	89,878,655	5,991,345	6,790,428	8,016,127	20,797,900	69,080,755

[a] Amounts available for obligation exclude FY 1968 appropriations not yet enacted.

DEPARTMENT OF THE ARMY

	Available for obligation	Obligations				Unobligated balance Sept. 30, 1967
		July 1967	Aug. 1967	Sept. 1967	Cum. thru Sept. 30, 1967	
Military Personnel						
Active forces	7,887,358	665,886	629,518	628,200	1,923,604	5,963,755
Reserve forces	644,100	93,434	64,012	34,310	191,756	452,344
Total—Military Personnel	8,531,459	759,320	693,530	662,510	2,115,360	6,416,099
Operation and Maintenance	8,082,343	659,044	765,191	720,848	2,145,083	5,937,259
Procurement						
Aircraft	839,970	6,122	18,257	104,983	129,362	710,608
Missiles	538,417	−609	31,141	43,263	73,795	464,622
Tracked combat vehicles	335,741	32,512	102,438	22,004	156,954	178,787
Ordnance, vehicles and related equipment	4,258,921	85,314	504,365	633,690	1,223,369	3,035,552
Electronics and communications	662,328	48,622	79,877	38,129	166,628	495,700
Other procurement	706,145	11,065	76,572	102,967	190,604	515,541
Undistributed	2,217,566	—	—	—	—	2,217,566
Total—Procurement	9,559,088	183,027	812,649	945,036	1,940,712	7,618,376
Research, Development, Test, & Evaluation						
Military sciences	186,209	27,781	16,064	6,670	50,515	135,694
Aircraft	147,521	45,654	11,162	5,449	62,265	85,256
Missiles	734,987	34,044	29,860	271,325	335,229	399,758
Astronautics	14,060	795	1,107	1,234	3,136	10,924
Ordnance, vehicles and related equipment	204,759	14,539	37,257	19,859	71,655	133,104
Other equipment	403,596	24,743	31,483	21,541	77,767	325,829
Program-wide management and support	83,505	14,551	6,722	9,613	30,886	52,619
Undistributed	160	−2,152	2,642	−490	—	160
Total—Research, Development, Test & Eval.	1,774,799	159,955	136,297	335,201	631,453	1,143,347
Military Construction	[a]883,466	24,405	48,985	55,963	129,353	754,113
TOTAL—DEPARTMENT OF THE ARMY	28,831,156	1,785,750	2,456,652	2,719,559	6,961,961	21,869,194

[a] Amounts available for obligation exclude FY 1968 appropriations not yet enacted.

DEPARTMENT OF THE AIR FORCE

	Available for obligation	Obligations				Unobligated balance Sept. 30, 1967
		July 1967	Aug. 1967	Sept. 1967	Cum. thru Sept. 30, 1967	
Military Personnal						
Active forces	5,647,300	480,654	473,889	466,361	1,420,904	4,226,396
Reserve forces	160,055	18,320	17,014	11,362	46,696	113,359
Total—Military Personnel	5,807,355	498,974	490,903	477,724	1,467,601	4,339,754
Operation and Maintenance	6,100,295	667,933	581,775	584,103	1,833,811	4,266,484
Procurement						
Aircraft	7,764,371	305,551	125,090	1,155,532	1,586,173	6,178,198
Missiles	1,613,168	59,820	83,292	114,620	257,732	1,355,436
Ships	—	—	—	—	—	—
Ordnance, vehicles and related equipment	1,567,923	184,628	489,289	107,098	781,015	786,908
Electronics and communications	447,282	20,404	49,891	44,264	114,559	332,723
Other Procurement	543,637	3,540	66,822	−7,264	63,098	480,539
Undistributed	668,803	—	—	—	—	668,803
Total—Procurement	12,605,186	573,943	814,384	1,414,251	2,802,578	9,802,608
Research, Development, Test, & Evaluation						
Military sciences	186,824	4,406	17,698	12,816	34,920	151,904
Aircraft	937,335	194,734	81,606	32,563	308,903	628,432
Missiles	946,715	178,533	91,040	108,005	377,578	569,137
Astronautics	1,294,567	195,361	46,725	73,517	315,603	978,964
Other equipment	351,843	38,708	26,301	42,645	107,654	244,189
Program-wide management and support	267,943	40,485	26,207	18,712	85,404	182,539
Undistributed	−151,680	—	—	—	—	−151,680
Total—Research, Development, Test & Eval.	3,833,548	652,225	289,579	288,259	1,230,063	2,603,485
Military Construction	[a]279,837	18,514	38,503	25,702	82,719	197,118
TOTAL—DEPARTMENT OF THE AIR FORCE	28,626,221	2,411,590	2,215,142	2,790,040	7,416,772	21,209,449

[a] Amounts available for obligation exclude FY 1968 appropriations not yet enacted.

DEPARTMENT OF THE NAVY

	Available for obligation	Obligations				Unobligated balance Sept. 30, 1967
		July 1967	Aug. 1967	Sept. 1967	Cum. thru Sept. 30, 1967	
Military Personnel						
Active forces	5,473,600	462,220	439,674	452,678	1,354,572	4,119,028
Reserve forces	154,620	16,022	15,491	11,512	43,025	111,595
Total—Military Personnel	5,628,220	478,243	455,165	464,190	1,397,598	4,230,622
Operation and Maintenance	5,817,321	381,376	590,175	532,806	1,504,357	4,312,963
Procurement						
Aircraft	3,964,038	56,894	58,097	160,344	275,335	3,688,703
Missiles	836,317	4,214	25,951	118,420	148,585	687,732
Ships	4,617,146	117,656	57,684	155,997	331,337	4,285,809
Tracked combat vehicles	10,820	7	978	1,278	2,263	8,557
Ordnance, vehicles and related equipment	2,459,282	25,116	46,498	314,742	386,356	2,072,926
Electronics and communications	705,075	9,329	9,449	33,191	51,969	653,106
Other procurement	1,222,275	71,614	66,595	65,358	203,567	1,018,708
Undistributed	−269,068	—	—	—	—	−269,068
Total—Procurement	13,545,883	284,827	265,256	849,328	1,399,411	12,146,472
Research, Development, Test, and Evaluation						
Military sciences	100,121	18,290	8,444	36,730	63,464	36,657
Aircraft	137,541	13,024	15,188	28,777	56,989	80,552
Missiles	568,622	87,196	239,380	135,887	462,463	106,159
Astronautics	14,004	3,397	884	1,012	5,293	8,711
Ships	178,775	39,409	47,453	24,076	110,938	67,837
Ordnance, vehicles and related equipment	80,160	9,753	19,319	17,411	46,483	33,677
Other equipment	51,995	9,133	15,244	6,428	30,805	21,190
Program-wide management and support	124,270	13,710	20,440	25,812	59,962	64,308
Undistributed	1,003,707	—	—	—	—	1,003,707
Total Research, Development, Test & Eval.	2,259,195	193,912	366,352	276,133	836,397	1,422,798
Military Construction	[a]583,977	22,501	30,941	31,240	84,682	499,295
TOTAL—DEPARTMENT OF THE NAVY	27,834,597	1,360,859	1,707,888	2,153,698	5,222,445	22,612,151

[a] Amounts available for obligation exclude FY 1968 appropriations not yet enacted.

DEFENSE AGENCIES/OFFICE OF THE SECRETARY OF DEFENSE

	Available for obligation	Obligations				Unobligated balance Sept. 30, 1967
		July 1967	Aug. 1967	Sept. 1967	Cum. thru Sept. 30, 1967	
Military Personnel						
Retired Pay	2,020,000	163,554	165,448	167,310	496,312	1,523,688
Operation and Maintenance	1,038,753	91,456	92,458	79,613	263,527	775,226
Procurement						
Ordnance, Vehicles and related equipment	2,187	452	62	228	742	1,445
Electronics and communications	13,437	33	289	1,122	1,444	11,993
Other procurement	57,360	2,953	1,279	4,794	9,026	48,334
Undistributed	13,643	—	—	—	—	13,643
Total—Procurement	86,627	3,438	1,630	6,144	11,212	75,415
Research, Development, Test, and Evaluation						
Military sciences	571,032	19,821	29,471	26,855	76,147	494,885
Emergency Fund	100,000	—	—	—	—	100,000
Undistributed	—	—	—	—	—	—
Total—Research, Development, Test & Eval.	671,032	19,821	29,471	26,855	76,147	594,885
Military Construction	[a]14,163	1,426	−218	300	1,508	12,655
Family Housing	[a]310,335	889	112,159	55,487	168,535	141,800
Other—Special Foreign Currency Program	16,344	511	—	−511	—	16,344
TOTAL—DEFENSE AGENCIES/OSD	4,157,255	281,095	400,948	335,198	1,017,241	3,140,014

OFFICE OF CIVIL DEFENSE

Civil Defense	[a]32,544	5,316	4,967	3,873	14,156	18,389

MILITARY ASSISTANCE

Military Personnel	35	44	−1	−8	35	—
Operation and Maintenance	301,516	77,967	7,563	14,918	100,448	201,068
Procurement						
Aircraft	14,680	16,869	−1,813	−463	14,593	87
Missiles	−235	1,363	−1,751	−12	−400	165
Ships	6,062	7,280	−1,150	−68	6,062	—
Ordnance, vehicles and related equipment	23,750	25,768	−1,484	−530	23,754	−4
Electronics and communications	9,596	9,363	64	167	9,594	2
Other procurement	12,959	10,207	2,934	−242	12,899	60
Total—Procurement	66,812	70,850	−3,200	−1,147	66,503	310
Research, Development, Test, and Evaluation	−1,300	—	−1,300	−1	−1,301	1
Military Construction	29,642	—	358	—	−358	30,000
Undistributed	177	−2,126	2,126	—	—	177
TOTAL—MILITARY ASSISTANCE	[a]396,883	146,736	4,829	13,761	165,326	231,557

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[a] Amounts available for obligation exclude FY 1968 appropriations not yet enacted.

DEFENSE PROCUREMENT

Contracts of $1,000,000 and over awarded during the month of December 1967:

DEFENSE SUPPLY AGENCY

1—**General Aniline & Film Corp.**, New York, N.Y. $1,089,327. 20,500 rolls of aerial film. Defense General Supply Center, Richmond, Va. DSA 400-68-C-2805.

—The Defense Fuel Supply Center, Alexandria, Va., has awarded the following contracts for petroleum products:

JP-5 fuel

Golden Eagle Refining Co., Los Angeles, Calif. $1,139,460. 8,400,000 gallons. DSA 600-68-D-0920.

Edgington Oil Refineries, Long Beach, Calif. $1,600,000. 12,000,000 gallons. DSA 600-68-D-0918.

Douglas Oil Co. of Calif., Los Angeles, Calif. $1,873,500. 15,000,000 gallons. DSA 600-68-D-0932.

Gulf Oil Corp., New York, N.Y. $4,296,600. 42,000,000 gallons. DSA 600-68-D-0921.

Hess Oil & Chemical Corp., Perth Amboy, N.J. $2,788,380. 25,200,000 gallons. DSA 600-68-D-0924.

Humble Oil & Refining Co., Houston, Tex. $9,105,600. 92,400,000 gallons. DSA 600-68-D-0925.

Kern County Refinery, Los Angeles, Calif. $1,177,812. 8,000,000 gallons. DSA 600-68-D-0926.

Mobil Oil Corp., New York, N.Y. $8,156,200. 79,009,640 gallons. DSA 600-68-D-0928.

Phillips Petroleum Co., Bartlesville, Okla. $1,181,275. 9,400,000 gallons. DSA 600-68-D-0929.

Sun Oil Co., Philadelphia, Pa. $3,292,659. 27,720,000 gallons. DSA 600-68-D-0930.

JP-4 Fuel

Adobe Refining Co., Midland, Tex. $3,586,050. 33,000,000 gallons. DSA 600-68-D-0933.

Alabama Refining Co., Theodore, Ala. $2,484,694. 23,572,000 gallons. DSA 600-68-D-0934.

American Oil Co., Chicago, Ill. $15,352,681. 150,903,000 gallons. DSA 600-68-D-0975.

American Petrofina Co. of Tex., Dallas, Tex. $3,912,970. 40,000,000 gallons. DSA 600-68-D-0976.

Ashland Oil & Refining Co., Ashland, Ky. $5,695,590. 53,107,402 gallons. DSA 600-68-D-0977.

Atlantic Richfield Co., Philadelphia, Pa. $3,501,000. 30,000,000 gallons. DSA 600-68-D-0979.

Atlantic Richfield Co., Los Angeles, Calif. $2,725,800. 21,000,000 gallons. DSA 600-68-D-0978.

Bayou Refining Co., Pasadena, Tex. $1,884,359. 18,470,000 gallons. DSA 600-68-D-0938.

Bell Oil & Gas Co., Bartlesville, Okla. $4,672,939. 50,000,000 gallons. DSA 600-68-D-0940.

Cities Service Oil Co., New York, N.Y. $4,078,667. 42,840,000 gallons. DSA 600-68-D-0982.

CONTRACT LEGEND

Contract information is listed in the following sequence: Date—Company — Value — Material or Work to be Performed—Location of Work Performed (if other than company plant) — Contracting agency—Contract number.

Chevron Oil Co., Denver, Colo. $1,306,987. 13,488,000 gallons. DSA 600-68-D-1009.

Coastal States Petrochemical Co., Houston, Tex. $20,231,401. 194,460,000 gallons. DSA 600-68-D-0983.

Continental Oil Co., Houston, Tex. $9,628,368. 95,596,400 gallons. DSA 600-68-D-0984.

Crystal Flash Petroleum Corp., Indianapolis, Ind. $1,533,922. 13,520,000 gallons. DSA 600-68-D-0943.

Delta Refining Co., Memphis, Tenn. $4,332,445. 40,000,000 gallons. DSA 600-68-D-0944 and P001.

Derby Refining Co., Wichita, Kan. $1,065,104. 12,000,000 gallons. DSA-600-68-D-0985.

Douglas Oil Co. of Calif., Los Angeles, Calif. $2,853,400. 24,000,000 gallons. DSA 600-68-D-0986.

Edgington Oil Refineries, Long Beach, Calif. $2,366,000. 19,250,000 gallons. DSA 600-68-D-0945.

Fletcher Oil & Refining Co., Wilmington, Calif. $2,545,900. 20,000,000 gallons. DSA 600-68-D-0948.

Fort Worth Refining Co., Houston, Tex. $4,495,397. 42,000,000 gallons. DSA 600-68-D-0949 and P001.

Getty Oil Co., New York, N.Y. $5,013,612. 43,570,800 gallons. DSA 600-68-D-0987.

Good Hope Refineries, Houston, Tex. $3,573,422. 34,000,000 gallons. DSA 600-68-D-0953 and P001.

Gulf Oil Corp., New York, N.Y. $15,183,000. 147,000,000 gallons. DSA 600-68-D-0988.

Gulf Oil Corp., Houston, Tex., $1,135,000. 10,000,000 gallons. DSA 600-68-D-0989.

Hercules Oil Co., Long Beach, Calif. $1,178,479. 9,000,000 gallons. DSA 600-68-D-0954 and P001.

Hess Oil & Chemical Corp., Perth Amboy, N.J. $2,875,320. 29,400,000 gallons. DSA 600-68-D-0990.

Howell Refining Co., San Antonio, Tex. $4,013,251. 36,750,000 gallons. DSA 600-68-D-0955 and P001.

Humble Oil & Refining Co., Houston, Tex. $25,727,131. 260,809,000 gallons. DSA 600-68-D-0991.

Hunt Oil Co., Dallas, Tex. $1,423,500. 14,600,000 gallons. DSA 600-68-D-0992.

Kerr-McGee Corp., Oklahoma City, Okla. $1,410,000. 15,000,000 gallons. DSA 600-68-D-0994.

MacMillan Ring-Free Oil Co., Los Angeles, Calif. $2,311,400. 18,000,000 gallons. DSA 600-68-D-0961.

Mobil Oil Corp., New York, N.Y. $11,690,323. 102,422,898 gallons. DSA 600-68-D-0996.

Monarch Refining Co., San Antonio, Tex. $1,102,032. 10,000,000 gallons. DSA 600-68-D-0963 and P001.

Okmulgee Refining Co., Okmulgee, Okla. $2,312,200. 23,600,000 gallons. DSA 600-68-D-0965 and P001.

Phillips Petroleum Co., Bartlesville, Okla. $4,597,415. 40,510,000 gallons. DSA 600-68-D-0997.

Shamrock Oil & Gas Corp., Amarillo, Tex. $2,658,700. 24,560,000 gallons. DSA 600-68-D-0999.

Shell Oil Co., New York, N.Y. $1,779,876. 17,640,000 gallons. DSA 600-68-D-1000.

Signal Oil & Gas Co., Houston, Tex. $1,636,800. 16,000,000 gallons. DSA 600-68-D-0913.

Sinclair Refining Co., New York, N.Y. $4,489,800. 42,000,000 gallons. DSA 600-68-D-1001.

Sioux Oil Co., Newcastle, Wyo. $2,410,000. 20,000,000 gallons. DSA 600-68-D-0969.

Southland Oil Co., Yazoo City, Miss. $1,097,258. 10,500,000 gallons. DSA 600-68-D-0970 and P001.

Standard Oil Co. of Calif. (Western Operations). $25,052,241. 231,221,600 gallons. DSA 600-68-D-1008.

Sun Oil Co., Philadelphia, Pa. $8,580,600. 75,600,000 gallons. DSA 600-68-D-1002.

Sunray DX Oil Co., Tulsa, Okla. $2,300,324. 23,800,000 gallons. DSA 600-68-D-1003.

Suntide Refining Co., Tulsa, Okla. $1,952,060. 19,000,000 gallons. DSA 600-68-D-1004.

Tesoro Petroleum Corp., San Antonio, Tex. $1,810,021. 16,000,000 gallons. DSA 600-68-D-0971 and P001.

Texas City Refining, Texas City, Tex. $1,961,820. 19,320,000 gallons. DSA 600-68-D-1005.

Golden Eagle Refining Co., Los Angeles, Calif. $6,433,560. 50,400,000 gallons. DSA 600-68-D-0952 and P001.

Tonkawa Refining Co., Arnett, Okla. $2,109,252. 20,000,000 gallons. DSA 600-68-D-0972 and P001.

Triangle Refineries, Houston, Tex. $1,875,424. 16,480,000 gallons. DSA 600-68-D-1006.

Union Oil Co. of Calif., Los Angeles, Calif. $10,134,726. 86,478,000 gallons. DSA 600-68-D-1007.

Various fuel products

Marathon Oil Co., New York, N.Y. $3,542,890. 910,000 barrels of diesel fuel. DSA 100-68-D-0817.

Humble Oil & Refining Co., Houston, Tex. $3,086,450. 500,000 barrels of automotive type 1; 190,000 barrels of diesel fuel and 25,000 barrels of kerosene. DSA 600-68-D-0808.

Hess Oil & Chemical Corp., Perth Amboy, N.J. $2,268,682. 555,000 barrels of diesel fuel. DSA 600-68-D-0816.

Texaco, Inc., New York, N.Y. $3,511,200. 800,000 barrels of automotive gasoline type 1. DSA 600-68-D-0822.

Standard Oil Co. of Calif., San Francisco, Calif. $1,300,825. 245,000 barrels of gasoline. DSA 600-68-D-0819.

Continental Oil Co., Houston, Tex. $3,033,225. 765,000 barrels of diesel marine fuel oil. DSA 600-68-D-0812.

Union Oil Co., Los Angeles, Calif. $1,055,000. 700,000 barrels of #6 fuel oil. DSA 600-68-D-0015.

5—**Plastoid Corp.**, Hamburg, N.J. $2,272,899. 43,738 reels of telephone field wire. Defense Industrial Supply Center, Philadelphia, Pa. DSA 500-68-C-6166.

12—**International Harvester Co.**, Melrose Park, Ill. $1,398,466. Fifty tractors. Defense Construction Supply Center, Columbus, Ohio. DSA 700-68-C-8323.

15—**Gulf Oil Corp.**, Houston, Tex. $4,123,939. 12,702,000 gallons of gasoline; 13,713,000 gallons of fuel oil; and 4,545,000 gallons of diesel fuel. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-1046.

—**American Oil Co.**, Chicago, Ill. $1,890,408. 11,616,000 gallons of gasoline; 91,000 gallons of fuel oil: and 1,000,000 gallons of diesel fuel. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-1027.

—**Cavalier Bag Co.**, Lumberton, N.C. $4,261,500. 23,500,000 osnaburg sand bags. Defense General Supply Center, Richmond, Va. DSA 400-68-C-3108.

—**Consolibag, Inc.**, Philadelphia, Pa. $2,550,940. 14,350,000 osnaburg sand bags. Defense General Supply Center, Richmond, Va. DSA 400-68-C-3109.

18—**Union Oil Co.**, Los Angeles, Calif. $6,336,150. 619,000 barrels of diesel fuel and 1,465,000 barrels of Navy special fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-0823.

—**Atlantic Richfield Co.**, Los Angeles, Calif. $1,685,170. 81,000 barrels of diesel fuel and 500,000 barrels of Navy special fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-0811.

—**Golden Eagle Refining Co.**, Los Angeles, Calif. $1,604,000. 600,000 barrels of Navy special fuel oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600-68-D-0815.

—**U.S. Steel**, New York, N.Y. $1,619,285. 133,478 spools of barbed wire. Defense

Construction Supply Center, Columbus, Ohio. DSA 700–68–C–3608.

—**C. F. and I. Steel Corp.**, Denver, Colo. $1,228,170. 117,000 spools of barbed wire. Defense Construction Supply Center, Columbus, Ohio. DSA 700–68–C–3604.

19—**Harnischferger Corp.**, Milwaukee, Wis. $1,134,419. 26 truck-mounted cranes with various attachments. Defense Construction Supply Center, Columbus, Ohio. DSA 700–68–C–8494.

20—**Royal Lubricants Co.**, Hanover, N.J. $2,728,166. 760,396 gallons of synthetic jet turbine lube oil. Defense Fuel Supply Center, Alexandria, Va. DSA 600–68–C–0906.

21—**Riegel Textile Corp.**, New York, N.Y. $11,052,480. 8,700,000 linear yards of wind-resistant poplin cotton cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–68–C–1180.

22—**American Cyanamid Co.**, Princeton, N.J. $1,249,727. 3,555 drums of insecticide. Defense General Supply Center, Richmond, Va. DSA 400–68–C–2804.

26—**Bibb Mfg. Co.**, Macon, Ga. $2,307,900. 630,000 linear yards of polyamide, high temperature resistant herring-bone twill cloth. Defense Personnel Support Center, Philadelphia, Pa. DSA 100–68–C–1157.

28—**Outboard Marine Corp.**, Waukegan, Ill. $1,586,376. 1,200 centrifugal pumps. Defense Construction Supply Center, Columbus, Ohio. DSA 700–67–C–H–155.

DEPARTMENT OF THE ARMY

1—**McDonnell Douglas Corp.**, Santa Monica, Calif. $7,000,000. Development and conduct of experiments on techniques for guidance and control of anti-ballistic missile defense interceptcrs. Army Missile Command, Huntsville, Ala.

—**AVCO Corp.**, Stratford, Conn. $3,968,190. Combustion chamber assemblies for UH–1 helicopter engines. Aviation Materiel Command, St. Louis, Mo. AF–41608–67–A3234.

—**Institute for Defense Analyses**, Arlington, Va. $3,900,000. Research and analyses of space science, ballistic missile defense, equipment, and facilities to achieve military and scientific capabilities. $2,772,000. Evaluation and operational analyses for the Joint Chiefs of Staff and Dir., Defense Research and Engineering. Defense Supply Service, Washington, D.C. DA HC–15–67–CQ011 and DA HC15–67–C–0012.

—**General Motors**, Ypsilanti, Mich. $3,738,750. 20mm automatic guns and components mounted on aircraft. Army Weapons Command, Rock Island, Ill. DA–AF03–67–C–0003.

—**Rulon Co.**, Chicago, Ill. $1,631,850. Subcomponents of the M1 delay plunger for the M557 artillery fuze. Ammunition Procurement & Supply Agency, Joliet, Ill. DA–AA09–68–C–0193.

—**Firestone Tire & Rubber Co.**, Akron, Ohio. $1,417,525. Track shoe assemblies for M60 tanks. Noblesville, Ind. Tank Automotive Command, Warren, Mich. DA–AE07–68–C–1477.

—**Rohm & Hass Co.**, Philadelphia, Pa. $1,250,000. Propellant research. Huntsville, Ala. Army Missile Command, Huntsville, Ala. DA–AH01–68–C–0891.

—**Pace Corp.**, Memphis, Tenn. $1,160,000. Flares. Memphis, Tenn.; Russell Ark.; and Camden, Ark. Picatinny Arsenal, Dover, N.J. DA–AA21–68–C–0497.

4—**Bell Helicopter Co.**, Fort Worth, Tex. $3,488,859. Rudder rotor blades for UH–1 helicopters. $8,504,887. Rotory wing blades for UH–1 helicopters. Aviation Materiel Command, St. Louis, Mo. DA AJ–01–67–A0014 D.O. 3479 and 3478.

5—**Bendix Corp.**, Baltimore, Md. $1,485,000. Shelters with AN/GRC–147 radio sets installed. Electronics Command, Philadelphia, Pa. DA AB 05–68–C–1713.

—**FMC Corp.**, San Jose, Calif. $1,547,656. Hawk loader transporters. Tank Automotive Command, Warren, Mich. DA AE–07–68–C–1092.

—**Raytheon Co.**, Lexington, Mass. $1,976,250. Metal parts for bomb fuzes. Ammunition Procurement & Supply Agency, Joyiet, Ill. DA AA–09–68–C–0243.

6—**Continental Motors**, Mobile, Ala. $4,000,000. Rebuilding and/or retrofit of multi-fuel engines for 5-ton trucks, Tank Automotive Command, Warren, Mich. DA–AE07–68–C–1093.

—**Weatherhead Co.**, Cleveland, Ohio. $1,492,050. Metal parts for 90mm HEAT projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA–AA09–68–C–0253.

7—**Stan Flowers Co.**, Oakland, Calif. $1,243,022. Carpentry and related work for period of Jan. 1, 1968 through Dec. 31, 1969. Western Area, Military Traffic Management and Terminal Service, Oakland, Calif. DA–HC–23–68–D0028.

8—**LTV Electrosystems**, Huntington, Ind. $2,199,540. Lightweight man-packed radio sets. Electronics Command, Philadelphia, Pa. DA–AB05–68–C–0005.

—**Wilkinson Mfg. Co.**, Fort Calhoun, Neb. $1,399,905. Fin assemblies for 60mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA–AA09–68–C–0126.

—**Northrop Corp.**, Needham Heights, Mass. $1,024,860. Fin assemblies for 81mm mortar projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA–AA09–68–C–0251.

—**Bowen McLaughlin-York Co.**, York, Pa. $4,983,954. Supplies and services to convert M48A1 tanks to M48A3 configuration. Army Weapons Command, Rock Island, Ill. DA–AF03–67–C–0076.

—**Eureka-Williams Corp.**, Bloomington, Ill. $5,291,500. Metal parts for bomb fuzes. Ammunition Procurement & Supply Agency, Joliet, Ill. DA–AA09–68–C–0256.

—**Magnavox Co.**, Fort Wayne, Ind. $1,235,300. Advanced development models of ultra reliable receiver transmitters. Electronics Command, Philadelphia, Pa. DA–AB07–68–C–0127.

—**Johnson Corp.**, Bellevue, Ohio. $2,321,701. Two-wheel cargo trailers and trailer chassis. Tank Automotive Command, Warren, Mich. DA–AE0–68–C–0920.

—**Litton Industries**, Van Nuys, Calif. $6,300,000. Tactical Fire Direction. Electronics Command, Fort Monmouth, N.J. DA–AB07–68–C–0154.

11—**National Union Electric Co.**, Bloomington, Ill. $3,318,900. Metal parts for mechanical time fuzes for bomblet dispensers. Ammunition Procurement & Supply Agency, Joliet, Ill. DA–AA09–67–C–0106.

—**U.S. Steel**, Pittsburgh, Pa. $1,063,675. Metal parts for 8-inch projectiles. Berwick, Pa. Ammunition Procurement & Supply Agency, Joliet, Ill. DA–AA09–67–C–0297.

12—**McGraw Edison Co.**, Bristol, Conn. $4,233,664. Time fuzes for artillery ammunition. Ammunition Procurement & Supply Agency, Joliet, Ill. DA–AA09–68–C–0224.

—**U.S. Steel**, Pittsburgh, Pa. $3,434,200. Metal parts for 8-inch projectiles. Berwick, Pa. Ammunition Procurement & Supply Agency, Joliet, Ill. DA–AA09–67–C–0279.

13—**TRW, Inc.**, Washington, D.C. $3,229,000. Continuation of design, development and interim operation of the Integrated Technical Data System for the Cheyene Project. Harry Diamond Laboratories, Washington, D.C. DA–49–186–AMC–C–0324.

—**Texas Instruments**, Dallas, Tex. $2,500,000. Infrared detecting sets. Procurement Div., Fort Monmouth, N.J. DA–AB07–68–C–0167.

—**AVCO Corp.**, Richmond, Ind. $1,238,400. Metal parts for adapter boosters for 750-lb. bombs. Ammunition Procurement & Supply Agency, Joliet, Ill. DA AA–09–68–C–0121.

14—**United Aircraft**, Stratford, Conn. $17,400,000. CH–54A helicopters, a main transmission test stand, and engineering and technical data. Aviation Materiel Command, St. Louis, Mo. DA–AJ01–67–C–0793.

15—**National Presto Industries**, Eau Clair, Wis. $20,967,140. Metal parts for 105mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA–AA09–68–C–0065.

—**AiResearch Mfg. Co.**, Phoenix, Ariz. $10,499,959. Medical unit self-contained transportable components. Mobility Equipment Command, St. Louis, Mo. DA–AK01–68–C–3858.

—**General Electric**, Burlington, Vt. $4,470,440. 7.62mm aircraft machine guns, spare parts and ancillary equipment. Army Weapons Command, Rock Island, Ill. DA–AF03–67–C–0014.

—**Harvey Aluminum, Inc.**, Torrance, Calif. $1,760,187. 40mm cartridge cases. Southwest Procurement Agency, Pasadena, Calif. DA–AG07–68–C–0653

—**Levinson Steel Co.**, Pittsburgh, Pa. $1,233,500. Reactivation and repair of Government owned facilities at Hays Army Ammunition Plant, Pittsburgh, Pa. Ammunition Procurement & Supply Agency, Joliet, Ill. DA–AA09–67–C–0154.

18—**Cadillac Gage Co.**, Warren, Mich. $1,343,000. 79 light armored cars. Tank Automotive Command, Warren, Mich. DA–AE07–68–C–0397.

—**Woodland Container Co.**, Aitkin, Minn. $1,212,478. Wood packing crates for mine canister kits. Staples, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA–AA09–68–C–0265.

—**Honeywell, Inc.**, North Hopkins, Minn. $1,090,980. Bomb dispensers. New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA–AA09–68–C–0257.

—**Northrop Carolina, Inc.**, Asheville, N.C. $1,191,000. 300,000 lbs. of riot control agent, CS–1. Army Arsenal, Edgewood, Md. AA–15–68–C–0297.

—**Aberthaw Construction**, Boston, Mass. $10,037,000. Construction of a high rise laboratory and auditorium and a center support building at the NASA Electronic Research Center, Cambridge, Mass. New England Div., Army Corps of Engineers, Waltham, Mass. DA–CA–33–68–C–9004.

19—**R. C. Can Co.**, Hazlewood, Mo. $1,695,573. Fiber ammunition containers for 81mm mortars. Ammunition Procurement & Supply Agency, Joliet, Ill. DA–AA09–68–C–0269.

—**Atwood Vacuum Machine Co.**, Rockford, Ill. $2,550,010. M12 links for 20mm cartridges. Frankford Arsenal, Philadelphia, Pa. DA–AA25–68–C–0348.

—**Teledyne, Inc.**, El Monte, Calif. $1,492,310. M12 links for 20mm csrtridges. Frankford Arsenal, Philadelphia, Pa. DA–AA–68–C–0349.

—**R. McMullan & Sons**, Honolulu, Hawaii. $2,094,770. Alteration and improvements to 12 three-story barracks at Schofield Barracks, Hawaii. Engineer Dist., Honolulu, Hawaii.

20—**Sperry Rand Corp.**, New York, N.Y. $4,324,978. Miscellaneous major caliber items, mines and bomb fuzes. Shreveport, La. Ammunition Procurement & Supply Agency, Joliet, Ill. DA–11–173–AMC–00080.

—**Hughes Aircraft**, Fullerton, Calif. $1,794,898. Industrial engineering services in support or air defense control and coordination system AN/TSQ–51. Army Missile Command, Huntsville, Ala. DA–01–021–AMC–15606 (Z).

—**Jackes-Evans Mfg. Co.**, St. Louis, Mo. $1,761,278. 7.62mm cartridge links. Frankford Arsenal, Philadelphia, Pa. DA–AA–25–67–C–0518.

—**Grumman Aircraft Engineering Corp.**, Bethpage, N.Y. $8,609,311. OV–1 Mohawk helicopters and related services. Stewart, Fla., Calverton and Bethpage, N.Y. Aviation Materiel Command, St. Louis, Mo. DA–AJ–OL–68–C–0190.

21—**Honeywell, Inc.**, Hopkins, Minn. $1,182,000. Research and development of ammunition. Picatinny Arsenal, Dover, N.J. DA–AA21–68–C–0353.

—**Stevens Mfg. Co.**, Ebensburg, Pa. $2,048,863. ¾-ton cargo trailers. Tank Automotive Command, Warren, Mich. DA–AE07–68–C–0978.

—**Brads Machine Products**, Gadsden, Ala. $7,324,800. Booster metal parts loaded with detonators. Ammunition Procurement & Supply Agency, Joliet, Ill. DA–AA09–68–C–0209.

—**Action Mfg. Co.**, Philadelphia, Pa. $1,022,900. Rocket fuzes, metal parts M412. Ammunition Procurement & Supply Agency, Joliet, Ill. DA–AA09–68–C–0271.

22—**University of Wisconsin**, Madison, Wis. $1,300,000. Advice and assistance in solving mathematical problems. Army Research Office, Durham, N.C. DA–31–124–ARO–D462.

—**Dirilyte Company of America**, Kokomo, Ind. $1,227,000. Fin blades for 2.75-inch rockets. Picatinny Arsenal, Dover, N.J. DA-AA21-68-C-0529.

—**F.T.S. Corp.**, Denver, Colo. $1,143,140. Fin blades for 2.75-inch rockets. Picatinny Arsenal Dover, N.J. DA-AA21-68-C-0528.

—**Emerson Electric Co.**, St. Louis, Mo. $2,057,187. Aircraft armament subsystems (XM28). Army Weapons Command, Rock Island, Ill. DA-AF03-67-C-0038.

—**Pace Corp.**, Memphis, Tenn. $2,093,675. Ground illuminating signals. Picatinny Arsenal, Dover, N.J. DA-AA21-68-C-0453.

—**Chrysler Corp.**, Warren, Mich. $3,844,072. M60A1E1 turret systems for M60 tanks, repair parts, periscopes and range cards. Warren, Mich.; Scranton, Pa.; Dayton, Ohio, Huntsville, Ala. and Centerline, Mich. Army Weapons Command, Rock Island, Ill. DA-11-199-AMC-662 (W).

—**Firestone Tire & Rubber Co.**, Akron, Ohio. $1,382,567. T136 track shoe assemblies. Noblesville, Ind. Tank Automotive Command, Warren, Mich. DA-AE07-68-C-1158.

—**General Time Corp.**, Stamford, Conn. $3,567,110. Mechanical time fuzes for artillery ammunition. Thomaston, Conn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0229.

—**Kemmons-Wilson, Inc., and South and Patton**, Memphis, Tenn. $5,943,652. 250 housing units with supporting facilities at Howard AFB, Canal Zone. Engineer Dist., Jacksonville, Fla. DA-CA17-68-C-0027.

—**Southern Airways Co.**, Atlanta, Ga. $16,999,300. Metal parts for 155mm projectiles. Sylacauga, Ala. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0277.

26—**Boeing Co.**, Morton, Pa. $2,453,874. Identification and fabrication of prototypes of ground support equipment and special tools for CH-47 Chinook Helicopters. Aviation Materiel Command, St. Louis, Mo. DA-AJ01-67-C-1026 (M).

—**E. I. DuPont**, Wilmington, Del. $1,724,250. T.N.T. Barksdale, Wis. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-11-173-AMC-985 (A).

—**Cleveland Container Corp.**, New York, N.Y. $1,702,107. Containers for 81mm mortar ammunition. Memphis, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0276.

—**Ford Motors**, Dearborn, Mich. $1,237,000. Engineering services for M656 five-ton trucks. Tank Automotive Command, Warren, Mich. DA-AE07-68-C-0445.

27—**Leece Neville Co.**, Cleveland, Ohio. $1,718,280. Generator assemblies for personnel carriers (M113). Tank Automotive Command, Warren, Mich. DA-AE07-68-C-0592.

—**Kennedy Van Saun Corp.**, Danville, Pa. $1,534,000. Metal parts for 105mm projectiles. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0109.

—**Harvey Aluminum, Inc.**, Torrance, Calif. $2,665,000. Metal parts for 20mm projectiles. Frankford Arsenal, Philadelphia, Pa. DA-AA25-68-C-0363.

28—**Union Carbide**, New York, N.Y. $3,057,252. Dry batteries for radio sets. Electronics Command, Philadelphia, Pa. DA-AB05-68-C-2172.

—**Clevite Corp.**, Freeport, Ill. $1,189,065. Dry batteries. Electronics Command, Philadelphia, Pa. DA-AB05-68-C-2169.

—**Honeywell, Inc.**, Hopkins, Minn. $6,345,298. Grenade fuzes. $6,433,666. XM219 grenade fuzes. New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0255 and DA-AA09-68-C-0282.

—**Bulova Watch Co.**, Jackson Heights, N.Y. $2,656,040. Metal parts for fuzes. Valley Stream, N.Y. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0283.

—**Western Electric**, New York, N.Y. $12,053,399. Planning activities on the Sentinel system and increased pre-production engineering and manufacturing preparation. Redstone Arsenal, Huntsville, Ala. DA-AA15-67-C-0265.

—**Philco-Ford Corp.**, Newport Beach, Calif. $2,250,000. Chaparral missile system components. $4,450,478. Army Missile Command, Huntsville, Ala. DA-AH01-68-C-0548; $4,450,478. Engineering services for FY 1968 for the Chaparral system. Army Missile Command, Huntsville, Ala. DA-AH01-68-C-1024; $1,476,000. 40mm grenade launchers for AH-1G Cobra helicopters. Southwest Procurement Agency, Pasadena, Calif. DA-AG07-68-C-00740.

—**Allison Steel Mfg. Co.**, Phoenix, Ariz. $1,984,000. Aluminum bridges (60-foot span). Mobility Equipment Command, St. Louis, Mo. DA-AK01-68-C-4304.

—**LaPointe Industries**, Rockville, Conn. $1,169,274. AS-1729/VRC base mounted antennae. Electronics Command, Philadelphia, Pa. DA-AB05-68-C-0009.

—**Mine Safety Appliance Co.**, Pittsburgh, Pa. $3,728,233. Field masks. Esmond, R.I. Army Arsenal, Edgewood, Md. DA-AA15-67-C-0265.

29—**Martin-Marietta Corp.**, Orlando, Fla. $1,009,230. Product improvement for selected items of Pershing missile equipment. DA-AH01-68-C-0392; $4,721,733. Shillelagh missiles. DA-01-021-AMC-14299 (Z); $12,714,086. Shillelagh missiles. DA-AH01-68-C-1020. Army Missile Command, Huntsville, Ala.

—**General Dynamics**, Pomona, Calif. $32,428,399. Redeye missiles. Army Missile Command, Huntsville, Ala. DA-AH01-68-C-0274.

—**Atlantic Research Corp.**, Alexandria, Va. $6,654,236. Propellant loading of Redeye missiles. Gainesville, Va. Army Missile Command, Huntsville, Ala. DA-AH01-68-C-0913.

—**Hughes Aircraft**, Culver City, Calif. $5,060,000. Industrial engineering services for the TOW weapon system for FY 1968. Army Missile Command, Huntsville, Ala. DA-AH01-68-C-0272.

—**Hayes International Corp.**, Huntsville, Ala. $1,471,500. Hardware and documentation for general transfer and reference sets for the Metrology Calibration Center. Army Missile Command, Huntsville, Ala. DA-AH01-68-C-0990.

—**Alsco, Inc.**, St. Louis, Mo. $1,158,429. 2.75-inch rocket launchers. Army Missile Command, Huntsville, Ala. DA-AH01-68-C-1029.

—**General Electric**, Syracuse, N.Y. $1,018,440. Installation of DAMWO Nike Hercules modification kits. Army Missile Command, Huntsville, Ala. DA-AH01-68-C-1001.

—**General Motors**, Detroit, Mich. $28,123,850. Metal parts for 105mm projectiles. St. Louis, Mo. DA-AA09-68-C-0066; $9,443,840. Body and band assemblies for 81mm cartridge projectiles. Warren, Mich. and Saginaw, Mich. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Atlantic Research Corp.**, West Hanover, Mass. $2,976,602. Assembly of openers for the Tactical Fighter Dispensing Munitions Program. DA-AA09-67-C-0230; $1,173,580. Loading assemblies for 60mm projectiles. DA-11-173 AMC 996(A). Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Day & Zimmerman, Inc.**, Philadelphia, Pa. $37,492,815. Loading, assembling and packing medium caliber projectiles and for maintenance and support services. Texarkana, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-11-173-AMC-114 (A).

—**Thiokol Chemical Corp.**, Bristol, Pa. $28,810,685. Loading, assembling and packing various ordnance items and for maintenance and support services. Marshall, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-11-173-AMC-200 (A).

—**U.S. Time Corp.**, Waterbury, Conn. $7,000,000. Fuzes for artillery ammunition. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-68-C-0289.

—**Mason & Hanger—Silas Mason Co.**, Lexington, Ky. $5,356,478. Loading, assembling and packing of miscellaneous items, medium and major caliber projectiles and related components. Burlington, Iowa. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-11-173-AMC-00085 (A).

—**Baldwin Electronics**, Little Rock, Ark. $1,693,072. Opener assemblies for the TFDM program. Camden, Ark. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-67-C-0326.

—**Fusion Rubbermaid** Corp., Statesville, N.C. $1,389,640. Plastic canisters for the TFDM program. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-67-C-0329.

—**Nash-Hammond, Inc.**, City of Industry, Calif. $1,205,085. Plastic canisters for the TFDM program. Ammunition Procurement & Supply Agency, Joliet, Ill. DA-AA09-67-C-0330.

—**Chrysler Corp.**, Centerline, Mich. $3,367,646. Engineering services in support of vehicles related to the M48 and M60 series of tanks. Tank Automotive Command, Warren, Mich. DA-AE07-67-C-5044.

—**Kaiser Jeep Corp.**, Toledo, Ohio. $1,089,898. M606 utility trucks. Tank Automotive Command, Warren, Mich. DA-AE07-67-C-5411.

—**Amron Corp.**, Waukesha, Wis. $5,365,050. 20mm brass cartridge cases. DA-AA25-68-C-0360; $1,762,550. 20mm brass cartridge cases. DA-AA25-67-C-0499. Frankford Arsenal, Philadelphia, Pa.

—**General Electric**, Burlington, Vt. $5,956,000. 20mm air defense artillery guns for the AM163 weapons system. Procurement Detachment, New York, N.Y. DA-AG25-68-C-0866.

—**Boeing Co.**, Morton, Pa. $1,400,000. Technical publication for CH-47A, B and C model helicopters to include operating and maintenance instructions, overhaul work requirements, vendor overhaul data, and avionics publications. Aviation Materiel Command, St. Louis, Mo. DA-AJ01-68-C-0069 (M).

—**Magnavox Co.**, Urbana, Ill. $1,400,000. Fuzes for the Redeye missile. Picatinny Arsenal, Dover, N.J. DA-AA21-68-C-0307.

—**Sperry Rand Corp.**, Phoenix, Ariz. $1,260,413. Aircraft compass magnetic radio indicators and electronic control amplifiers. Southwest Procurement Agency, Pasadena, Calif. DA-AG07-68-C-0711.

DEPARTMENT OF THE NAVY

1—**John C. Grimberg Co., and Sealand, Co.**, Rockville, Md. $1,316,000. Installation of central heating, air conditioning and utility distribution at Bolling AFB, Washington, D.C. Chesapeake Div., Naval Facilities Engineering Command, Washington, D.C. NBy-66240.

2—**Kollmorgen Corp.**, Holyoke, Mass. $2,593,770. Periscopes, adapters, repair parts and associated services. Northampton, Mass. Naval Ship Systems Command. N00024-68-C-5179.

5—**Lockheed Aircraft**, Burbank, Calif. $12,900,000. Change of P-3B aircraft to YP-3C configuration, plus associated material and services. Naval Air Systems Command. N00019-68-C-0043.

—**Otis Elevator Co.**, Brooklyn, N.Y. $2,834,502. Sonobuoys. Naval Air Systems Command. NOw 66-0651.

—**M.I.T.**, Cambridge, Mass. $1,800,000. Guidance tactical engineering support for the Polaris Missile. Special Projects Office. N00030-68-C-0154.

—**General Dynamics**, San Diego, Calif. $1,584,000. Tracking radar. Naval Air Systems Command. N00019-67-C-0131.

—**Thomas J. Doyle**, Lodi, Calif. $1,395,675. Construction of a maintenance dock, large aircraft fuel cell at Travis AFB, Calif. Western Div., Naval Facilities Engineering Command, San Bruno, Calif. NYb-81054.

6—**General Electric**, Utica, N.Y. $2,797,604. Airborne data processing systems. Naval Air Systems Command. N00019-67-C-0244.

7—**Ingalls Shipbuilding Co.**, Pasogoula, Miss. $4,000,000. Construction work on the nuclear powered attack submarine USS Pogy (SSN-647). Naval Ship Systems Command. N00024-68-C-0282.

—**Nacirema Operating Co.**, Baltimore, Md. $1,387,957. Stevedoring services to be performed at the Naval Air Station, Norfolk, Va. Naval Supply Center, Norfolk, Va. N00189-68-C-0313.

8—**Grumman Aircraft Engineering Corp.**, Bethpage, N.Y. $21,000,000. EA-6A aircraft. Naval Air Systems Command. N00019-67-C-0209.

—**Marinette Marine Corp.**, Marinette, Wis. $6,360,000. Construction of eight landing craft utility (LCU). Naval Ship Systems Command. N00024-68-C-0254.

—**Raytheon Co.**, Lexington, Mass. $3,880,207. Sparrow III guided missiles. Lowell, Mass., Bristol, Tenn. and Oxnard, Calif. Naval Air Systems Command. NOw 66-0149.

—**Marinette Marine Corp.**, Marinette, Wis. $3,398,096. Construction of 104 landing craft, personnel, large (LCP(1)). Naval Ship Systems Command. N00024-68-C-0266.

—**Harbor Boat Building Co.**, Terminal Island, Calif. $1,106,611. Regular overhaul of the minesweepers USS Constant and USS Energy. Supervisor of Shipbuilding, Eleventh Naval Dist.. Long Beach, Calif. N62791-68-B-0052.

—**Sperry Gyroscope Co.**, Great Neck, N.Y. $1,000,000. Modification kits for radar sets. Headquarters, Marine Corps.

11—**General Dynamics**, Pomona, Calif. $6,700,000. Increase of limitation for authorization of production for Standard missiles (medium range). Naval Ordnance Systems Command. N00017-67-C-0047.

—**Honeywell, Inc.**, North Hopkins, Minn. $1,974,601. Production of ignition separation assemblies and igniters for the Asroc missile. Saugus, Calif. Naval Ordnance Systems Command. N00017-67-C-1109.

12—**LTV Aerospace Corp.**, Dallas, Tex. $22,551,482. A-7E aircraft. Naval Air Systems Command. N00019-68-C-0075.

—**Sanders Associates**, Nashua, N.H. $2,162,424. Classified Electronics Equipment. Naval Air Systems Command. N00019-67-C-0552.

—**Honeywell, Inc.**, West Covina, Calif. $1,386,497. Production of Asroc depth charge adaption kits. Naval Ordnance Systems Command. N00017-67-C-1120.

13—**Grumman Aircraft Engineering Corp.**, Bethpage, N.Y. $32,500,000. Incorporation of general purpose computers in E2A aircraft. Naval Air Systems Command. N00019-67-C-0657.

—**Litton Systems**, Silver Spring, Md. $1,675,841. Radar altimeter receiver transmitters. Aviation Supply Office, Philadelphia, Pa. N00383-67-C-0461.

—**King-Hunter, Inc.**, Greensboro, N.C. $1,263,591. Construction of a BOQ and a mess addition at Marine Corps Air Facility, Jacksonville, N.C. Atlantic Div., Naval Facilities Engineering Command.

—**Philco-Ford Corp.**, Fort Washington, Pa. $1,251,062. Professional technical engineering effort to instruct and train Navy personnel in the assembly and repair of Navy radar, sonar, and communications equipment. Naval Ship Systems Command. N00024-68-C-1066.

14—**Hughes Aircraft**, Culver City, Calif. $1,495,428. Work on rocket motors for the Phoenix missile. Naval Air Systems Command. N00019-67-C-0178.

—**Talley Industries**, Mesa, Ariz. $1,073,781. MK II, MOD I, impulse cartridges used to activate ejection release of bombs and canisters. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-3341.

15—**General Electric**, Schenectady, N.Y. $32,054,900. Design and furnish Navy nuclear propulsion components. Naval Ship Systems Command. N00024-67-C-5056.

—**TRW Systems**. Washington, D.C. $10,000,000. Systems analysis, integration analysis, engineering support, technical management support and engineering laboratory experimentation for an ASW systems Project. Naval Ordnance Systems Command. N00017-68-C-1305.

—**LTV Aerospace Corp.**, Dallas, Tex. $3,100,000. A-7D aircraft. Naval Air Systems Command. N00019-67-C-0143.

—**PRD Electronics**, Westbury, N.Y. $2,447,517. Versatile Avionics Shop Test systems and associated ancillary items. Naval Air Systems Command. N00019-67-C-0484.

—**Brewer Dry Dock Co.**, Staten Island, N.Y. $1,068,000. Activation and overhaul of the high speed transport USS Bassett (APD-73). Supervisor of Shipbuilding, Fourth Naval Dist., Camden, N.J. IFB 62787-10006-68.

18—**Baifield Industries**, Dallas, Tex. $28,539,439. MK 15, MOD 1 fin assemblies for Snakeye missiles. Shreveport, La. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-3384.

—**Teledyne, Inc.**, Berwick, La. $3,498,498. Construction of 22 fifty-foot aluminum hulled patrol craft. Naval Ship Systems Command. N00024-68-C-0283.

—**Lasko Metal Products**, West Chester, Pa. $2,959,318. LAV-10A rocket launchers for Zuni rockets. Navy Ships Parts Control Center, Mechanicsburg, Pa. N104-68-C-3354.

—**American Mfg. Co. of Tex.**, Fort Worth, Tex. $1,752,300. MK 41, MOD 0 projectiles for 5-inch 54 cal. ammunition. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-3371.

—**Worldwide Moving & Storage, Inc.**, Honolulu, Hawaii. $1,169,229. Packing and crating of household goods. Naval Supply Center, Pearl Harbor, Hawaii. N00604-68-C-0232.

19—**Williams & Burroughs, Inc.**, Belmont, Calif. $3,124,700. Construction of barracks at Treasure Island Naval Station, Calif. Western Div., Naval Facilities Engineering Command.

—**RCA**, Van Nuys, Calif. $1,250,000. Radio frequency oscillators, repair parts and technical data. N00024-68-C-1119. $1,249,797. Radio frequency amplifiers, repair parts, associated test equipment and technical data. N00024-68-C-1118. Naval Ship Systems Command.

—**Meadow Gold Dairies**, Honolulu, Hawaii. $1,034,546. Dairy products for use in Navy messes for period Jan. 25, 1968 through July 24, 1968. Naval Supply Center, Pearl Harbor, Hawaii. N00604-68-C-0243.

20—**General Dynamics**, Pomona, Calif. $8,700,000. Airborne avionics equipment for use with Standard Arm missiles. Naval Air Systems Command. N00019-68-C-0074.

—**Western Electric**, New York, N.Y. $5,415,825. Oceanographic research. Whippany, N.J. Naval Electronic Systems Command. N00039-68-C-3584.

—**ESB, Inc.**, Philadelphia, Pa. $4,541,064. Submarine battery cells and elements. Naval Ship Systems Command. N00024-68-C-5210.

—**Curtiss Wright Corp.**, Wood-Ridge, N.J. $4,001,261. Installation of parts and spares in support of J-65-W20 engines for A-4C aircraft. Aviation Supply Office, Philadelphia, Pa. F41608-67-A-5900-GB128.

—**General Motors**, Indianapolis, Ind. $3,976,700. Modification kits for T-56-A-16 engines for C-130 aircraft. F34501-67-A-1594GBGM.

—**Raymond Engineering, Inc.**, Middletown, Conn. $2,709,000. MK 93 fuze assemblies for 5-inch Zuni rockets. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-0880.

—**Gould-National Batteries**, St. Paul, Minn. $1,789,108. Submarine batteries and spares. Kankakee, Ill. and Trenton, N.J. Naval Ship Systems Command. N00024-68-C-5211.

21—**Goodyear Aerospace Corp.**, Akron, Ohio. $4,850,000. Production of Subroc missiles. Naval Ordnance Systems Command. N00017-68-C-1408.

—**General Electric**, Schenectady, N.Y. $3,064,000. Nuclear propulsion components. Naval Ship Systems Command. N00024-67-C-5014.

—**Carrier Corp.**, Syracuse, N.Y. $2,047,609. Non-magnetic 25-ton air conditioning units for installation in ships. Naval Ship Systems Command. N00024-68-C-5119.

22—**American Machine & Foundry Co.**, York, Pa. $10,247,777. 500-lb. bomb bodies. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-0715.

—**Borg Warner Corp.**, Chicago, Ill. $5,136,045. 250-lb. bomb bodies. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-3418.

—**Northrop Corp.**, Palos Verdes Peninsula, Calif. $2,070,927. Systems engineering support of the deep submergence program. Naval Ship Systems Command. N00024-68-C-0215.

—**Westinghouse Electric**, Pittsburgh, Pa. $1,709,674. Design and furnish Navy nuclear propulsion components. Naval Ship Systems Command. NObs 94526.

—**General Electric**, Santa Barbara, Calif. $1,676,519. Research on Fleet ASW data analyses. Office of Naval Research. NONR 4781 (00).

—**Walter Kidde & Co.**, Belleville, N.J. $1,635,065. Airborne armament maintenance trailers. Naval Air Engineering Center, Philadelphia, Pa. N00156-68-C-1155.

26—**Grumman Aircraft Engineering Corp.**, Bethpage, N.Y. $65,900,000. A-6A aircraft. N00019-68-C-0106; $32,391,997. EA-6B aircraft. N00019-67-C-0078. Naval Air Systems Command.

—**Westinghouse Electric**, Baltimore, Md. $3,950,000. Airborne radar sets. Naval Air Systems Command. N00019-67-C-0173.

—**LTV Electrosystems, Inc.**, Greenville, Tex. $1,177,258. Modification of EC-121 aircraft. Naval Air Systems Command. NOw 65-0258-f.

—**Lockheed Missiles & Space Co.**, Sunnyvale, Calif. $37,250,465. Polaris Missile modification kits. Special Projects Office. N00030-67-C-0177.

—R.C.A., Camden, N.J. $7,471,250. Design and development of a shipboard interior communication system, technical data, and engineering services. Naval Ship Systems Command. 67-C-5547.

—**Texas Dynatronics Co.**, Dallas, Tex. $2,391,532. Head details used on 5-inch spinner rockets. Navy Ships Parts Control Center, Mechanicsburg, Pa. N00104-68-C-3405.

—**Scope, Inc.**, Reston, Va. $1,306,750. Classified electronics equipment. Falls Church, Va. Naval Ship Systems Command. N00024-67-C-1481.

—**Marquardt Corp.**, Van Nuys, Calif. $1,298,658. Exploratory development of an advanced fueling rocket system for air-launched missile applications. Naval Ordnance Station, Indian Head, Md. N00174-68-C-0222.

28—**Lockheed Aircraft**, Burbank, Calif. $10,431,979. Procurement of P-3B aircraft. Naval Air Systems Command. N00019-67-C-0057.

—**Harvard Industries**, Farmingdale, N.Y. $6,857,070. Production of a basic point defense surface missile system. Naval Ordnance Systems Command.

—**Westinghouse Electric**, Pittsburgh, Pa. $3,856,000. Design and furnish nuclear propulsion components. Naval Ship Systems Command. N00024-67-C-5177.

—**Motorola, Inc.**, Chicago, Ill. $1,876,416. Range azimuth indicators, repair parts, and engineering services. Naval Ship Systems Command. N00024-C-1036.

—**Fishbach & Moore, Inc.**, Dallas, Tex. $1,247,742. Procurement & installation of electronic equipment at the Naval Radio Station, Surgar Grove, W. Va. Chespeake Div., Naval Facilities Engineering Command, Washington, D.C. NBY 91882.

29—**Conduction Corp.**, Pomona, Calif. $1158,174. Device 15H12, a part task trainer to be used in training of Marine personnel in the operation of the sensor systems, Electronic Warfare Equipment and Communications Equipment aboard RF-4B aircraft. Naval Training Device Center, Orlando, Fla. N61339-68-C-0096.

DEPARTMENT OF THE AIR FORCE

1—**Fairchild Hiller**, Farmingdale, N.Y. $1,026,666. Installation of emergency flight control system kits for F-105 aircraft. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif. AF 34601-67-A-3070.

2—**Collins Radio Co.**, Cedar Rapids, Iowa. $3,127,642. Production of communication equipment for F-111 aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF 33657-67-C-0605-P002.

6—**Koehring Co.**, Springfield, Ohio. $1,454,960. Production of aircraft cargo loading/unloading trucks. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. AF F09603-67-C-3963-P002.

—**ITT Gilfillan, Inc.**, Los Angeles, Cailf. $6,335,813. Production of ground radar systems. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. AF 34601-68-C-1752C.

—**Electro-Mechanical Corp.**, Sayre, Pa. $2,-

230,413. Manufacture of expandable shelters. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF F-33657-68-C-0507.

—**McDonnell Douglas Corp.**, Huntington Beach, Calif. $1,808,084. Production of miscellaneous hardware components for Genie rockets. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah. AF F-04606-67-A-1431-QP02.

—**Cullman Metalcraft, Inc.**, Cullman, Ala. $1,269,604. Production of aircraft ordnance. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF F-33657-68-C-0624.

7—**Systems Development Corp.**, Santa Monica, Calif. $7,041,800. Computer programing services for satellite control facilities. Air Force Satellite Control Facility, Los Angeles, Calif. F04701-68-C-0103.

—**Philco-Ford**, Philadelphia, Pa. $3,477,676. Fabrication, repair and modification of air-to-air missiles and components. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga.

—**Chromalloy American Corp.**, New York, N.Y. $1,292,009. Repair of J-57 and J-75 aircraft engines. West Nyack, N.Y. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. F41608-67-D-7444-0003.

—**Sanders Associates**, Bedford, Mass. $3,-148,687. Production of airborne ordnance fuzes. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-0658.

—**Whittaker Corp.**, Chatsworth, Calif. $1,-879,381. Manufacture of airborne electronics components. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. F33657-68-C-0671.

—**R. G. Webb, Inc.**, and **Barney Wilkerson Construction**, Riverside, Calif. $2,464,000. Construction of 150 family housing units at Cannon AFB, N.M. Procurement Div., 832nd Combat Support Group, Cannon AFB, N.M. F29605-68-C-0040.

8—**Avco Corp.**, Stratford, Conn. $10,123,500. Production of ballistic missile penetration aids. Space and Missile Systems Organization, (AFSC), Los Angeles, Calif. F 04695-67-C-0148.

—**Radiation, Inc.**, Melbourne, Fla. $2,693,-753. Production and installation of telemetry and communication systems for the United Kingdom. Space and Missile Systems Organization, (AFSC), Los Angeles, Calif. F04695-67-C-0148.

—**Boeing Co.**, Seattle, Wash. $1,500,000. Modification of the second stage of a launch vehicle (burner II upper stage). Space and Missile Systems Organization, (AFSC), Los Angeles, Calif. F04695-67-C-0134.

—**Canadian Commercial Corp.**, Ottawa, Ontario, Canada. $1,702.299. Spare parts for R-4360 aircraft engines. Longueuil, Quebec, Canada. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex.

11—**Hazeltine Corp.**, Little Neck, N.Y. $2,-547,072. Production of airborne electronics equipment. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF F33657-67-C-1025-P004.

12—**Martin Marietta**, Denver, Colo. $4,392,-994. Design, development, fabrication and delivery of Titan III space boosters. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. AF 04(695) 150.

—**McDonnell Douglas Corp.**, Long Beach, Calif. $1,414,954. Production of components for fighter aircraft bomb racks. Torrance, Calif. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga. AF 04606-67-A-1432.

14—**General Motors**, Indianapolis, Ind. $13,-366,126. Produciton of T-56 aircraft engines and support equipment. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF 33657-67-C-1335.

—**Aerodex, Inc.**, Miami, Fla. $2,079,641. Overhaul of J-57 aircraft engines. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex. AF 41608-67-C-2200.

—**Planning Research Corp.**, Los Angeles, Calif. $1,128,000. Engineering research services on computer programming. Rome Air Development Center, Griffiss AFB, N.Y. AF 30602-68-C-0108.

15—**Illinois Institute of Technology**, Chicago, Ill. $4,501,353. Operation of an electromagnetic compatibility analysis center. Annapolis, Md. Electronic Systems Div., (AFSC), L. G. Hanscom Field, Mass. AF 19628-68-C-0130.

—**Garrett Corp.**, Phoenix, Ariz. $2,395,012. Production of gas turbine engines. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. AF 34601-67-C-5385.

18—**McDonnell Douglas Corp.**, St. Louis, Mo. $1,984,200. Modification of airborne electronics equipment on F-4 aircraft. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah.

19—**Martin Marietta**, Baltimore, Md. $1,115,-246. Modification of high frequency single band radios for F-101 aircraft. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah. AF 42600-68-C-1072.

—**American Electric**, La Mirada, Calif. $12,-597,812. Aircraft bombs. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah. AF 42600-68-C-1713.

—**United Aircraft**, East Hartford, Conn. $1,064,256. Spare parts for J-57 and TF-33 aircraft engines. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex.

—**Continental Aviation & Engineering Corp.**, Detroit, Mich. $1,540,000. Component improvement program in support of J69 engines. Aeronautical Systems Div., (AFSC), Wright Patterson AFB, Ohio. AF 33657-67-C-0887-POO1.

—**General Electric**, Cincinnati, Ohio. $50,-799,500. Production of J79 jet engines for F-4 aircraft. Evendale, Ohio. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF 33657-67-C-0074-P001.

22—**General Electric**, Cincinnati, Ohio. $5,-221,323. Production of J79 turbojet engines. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF 33657-67-C-1015.

—**Sylvania Electric Products**, Needham Heights, Mass. $3,736,770. Support of a ground electronics system. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. AF 04694-67-C-0050-P048.

—**American Electric**, LaMirada, Calif. $10,-519,014. Production of bomb fuze assemblies. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah. AF 42600-68-C-0230.

26—**United Technology Center**, Sunnyvale, Calif. $5,000,000. Procurement of Titan III Manned Orbiting Laboratory long-lead hardware for solid rocket motors. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. AF 04(695)-1022.

27—**General Electric**, West Lynn, Mass. $13,-945,000. Production of helicopter engines. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio. AF 33657-67-C-1428.

28—**Bendix Corp.**, Teterboro, N.J. $2,674,395. Repair of two platform gyros. F34601-68-C-1435; $3,896,732. Repair and/or modification of B-58 flight control systems. F 34601-68-D-1099. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.

29—**Western Electric**, New York, N.Y. $1,000,000. Operation and maintenance of ground guidance systems. Vandenberg AFB, Calif. and Burlington, N.C. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. F 04701-68-C-0138.

—**Sundstrand Aviation Corp.**, Rockford, Ill. $1,620,000. Production of constant speed drive assemblies. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla. F34601-68-C-2394.

—**General Motors**, Milwaukee, Wis. $7,000,-000. Work on the Titan III inertial guidance system. Space & Missile Systems Organization, (AFSC), Los Angeles, Calif. F04701-68-C-70065.

—**Riverside Research Institute**, New York, N.Y. $6,044,545. Research and development of the Ballistic Missile Defense Program. Electronics Systems Div., (AFSC), L. G. Hanscom Field, Mass. F 19682-68-C-0084.

OFF-SHORE PROCUREMENT

5—**Litton Systems (Canada), Ltd.**, Rexdale, Ontario, Canada. $1,809,308. Weapons release system (AN/ASQ-91) applicable to F-4 aircraft. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

Navy Tests Chemical Light for Underwater Use

The Ocean Engineering Division of the Naval Missile Center, Point Mugu, Calif., has been experimenting with several chemical light sources for underwater use by the Navy.

Ocean engineers have packaged the most promising chemicals in a new plastic material and obtained sufficient light to read by for periods of one-half hour.

The chemical does not need air to produce light making it ideal for underwater. Five hours after the chemical has been activated it still gives off enough light to read a watch dial. Even after 48 hours, the chemical gives off enough light to serve as a marker on land.

In pool tests, the chemical was effective as an underwater marker at distances of over 100 feet.

The chemical also proves useful as a light source for underwater photography at distances of up to 15 feet.

AMC Manuals Symposium Set for March 19–20 in Washington, D.C.

An Equipment Manuals Symposium, co-sponsored by the U.S. Army Materiel Command and the National Security Industrial Association, will be held on March 19–20 at the Statler Hilton Hotel, in Washington, D.C.

The objective of this symposium is to bring into focus the necessity for more effective manuals. It is intended to identify problems facing the user of equipment manuals and to present solutions for improving their effectiveness. A better understanding, within Government and industry, of interfacing activities, new techniques, methods and equipment should increase the effectiveness and improve the management of equipment manuals.

For additional information, the contact is:

National Security Industrial Association
Attention: Department EM
1030 15th St. NW
Washington, D.C. 20005
Phone: (202) 296–2266

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Performance Measurement Criteria for Defense Contracts Issued by DOD

The Defense Department has issued the latest in a series of publications, developed by the Office of the Assistant Secretary of Defense (Comptroller), in connection with the Selected Acquisition Information and Management System (SAIMS), one of DOD's Resource Management Systems. The publication is DOD Instruction 7000.2, "Performance Measurement for Selected Acquisitions."

The new instruction on performance measurement is based on an approach initially taken by the Air Force. It is the ultimate product of more than two years of effort in DOD staff coordination and discussions with industry through the Council of Defense and Space Industries Association. Individual drafts, describing DOD interest in this approach, were circulated widely throughout defense industry on two separate occasions.

The stated objective of the instruction is to "bring to the attention of and encourage DOD contractors to accept and install management control systems and procedures which are most effective in meeting their requirements." A key feature of the instruction is the statement of a set of Cost/Schedule Control Systems Criteria which a contractor's management control system must meet, while providing surveillance over the accomplishment of the cost, schedule and technical requirements of the contract.

Provisions of the instruction are effective immediately. Implementation of the criteria will be contractual and applied to future defense contracts for major acquisitions. Assuring the effective and efficient use of resources is a major consideration of all defense spending. Compliance with the new instruction is an important step in the realization of these goals.

Non-subscribers to the service for obtaining DOD publications may obtain copies of this instruction, one copy per request, from: Naval Supply Depot, Attention: Code 300, 5801 Tabor Avenue, Philadelphia, Pa., 19120.

IDEP Workshop Scheduled For May 1968

The sixth National Workshop Conference of the Interagency Data Exchange Program (IDEP) is scheduled for May 1–3, at the Ambassador Hotel, Los Angeles, Calif.

The IDEP program is sponsored by the Army, Navy, Air Force and the National Aeronautics and Space Administration to avoid duplication of effort in the testing of parts and materials, and to standardize test planning, test procedures and test reporting. Approximately 200 military and space contractors are participating in the program.

The 1968 workshop conference will be co-hosted by North American Rockwell Corp. and the Air Force Systems Command's Space and Missile Systems Organization. Co-sponsors are the Contractors Advisory Board and the Army, Navy, Air Force and National Aeronautics and Space Administration IDEP Policy Board.

For further information and advance registration, the contact is: Peter Amedeo, Grumman Aircraft Engineering Corp., Bethpage, L. I., N. Y. 11714.

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